Emerald

TES Plants
Biological Assessment/
Biological Evaluation

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For:

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Idaho Panhandle National Forests

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Emerald TES Plants BA/ BE

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Reported mileages are estimates and may vary depending on how they are rounded and what models and equations they are used for or result from.

Contents

Introduction

This Biological Assessment/ Biological Evaluation (BA/ BE) analyzes and discloses potential effects from implementation of the proposed Emerald project on federally listed threatened and endangered plant species and Forest Service Region 1 sensitive (TES) plant species, respectively.

The Emerald project proposes vegetation treatments for 2,553 acres (~12%) of the ~21,631-acre project area on National Forest System (NFS) lands within and around the East Fork Emerald Creek, West Fork Saint Maries River, and West Fork Emerald Creek drainages on the St. Joe Ranger District (RD) of the Idaho-Panhandle National Forests (IPNF). Proposed activities include regeneration harvest (2,478 acres) and site preparation to plant desired trees species, e.g., through slashing/ piling and burning slash piles and prescribed burning. Additionally, various types of roadwork would be conducted to permit access to and hauling of logs from units—including the construction of new and temporary roads, road maintenance, reconditioning, and reconstruction; a gravel pit would be expanded to provide material for roadwork. Restoration activities include improvements to aquatic habitat and stream conditions along the East Fork of Emerald Creek and 12 acres of aspen release (from encroaching conifers) in the northern part of the project area. See the Emerald EA for description of the purpose and need and Proposed Action.

No federally listed threatened or endangered plant species are known or suspected to occur in the project area; no suitable habitat or plant occurrences were found during surveys. Fifteen occurrences of four Forest Service Region 1 (R1) sensitive species have been documented in the project area (14 historic, 1 documented during project surveys in 2018); all occur outside of proposed Emerald treatment units. Should any additional TES plant sites be found in the future and deemed necessary to ensure species and population viability and prevent a potential trend toward federal listing, those sites would be protected.

Regulatory Framework

Endangered Species Act

The purpose of the Endangered Species Act (ESA) is to provide a means whereby the ecosystems upon which threatened and endangered (T&E) species depend may be conserved and to provide for the conservation of these federally listed species. The ESA directs federal agencies to ensure that any actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of T&E species or result in the destruction or adverse modification of their critical habitats (ESA Section 7(a)(2)).

National Forest Management Act

The National Forest Management Act (NFMA) of 1976 is the primary statute governing the administration of national forests; it was an amendment to the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on National Forest system land. NFMA changed forest planning by requiring the Forest Service to use a systematic, interdisciplinary approach to resource management, as well as providing for public involvement in preparing and revising forest plans. This includes a requirement that project-level planning comply with the National Environmental Policy Act (NEPA) and Land and Resource Management Plans.

Forest Service Manual

Forest Service Manual direction (FSM 2672.1 and FSM 2672.43) requires that proposed activities be reviewed for their potential effects on TES species and outlines policy, objectives, and procedures.

The Forest Service Manual (FSM 2670) (USDA 2005) directs national forests to assist states in achieving conservation goals for endemic species, complete biological evaluations of programs and activities, avoid and minimize impacts to species with viability concerns, analyze the significance of adverse effects on populations or habitat, and coordinate with states and USFWS.

The Forest Service Manual (2670.15) defines sensitive species as those plant species identified by the Regional Forester for which population viability is a concern, as evidenced by significant current or

predicted downward trend in numbers, density or habitat capability that would reduce a species' distribution.

FSM 2670.22 directs national forests to "maintain viable populations of all native and desired nonnative wildlife, fish, and plant species in habitats distributed throughout their geographic range on National Forest System lands." FSM 2670.32 states to "avoid or minimize impacts to species whose viability has been identified as a concern."

Land and Resource Management Plan

The Idaho Panhandle National Forests Land and Resource Management Plan (referred to as 2015 IPNF Forest Plan) (USDA 2015) includes the following desired condition and guideline statements for TES plants:

- FW-DC-VEG-09. (Desired Condition) Habitat for plant species listed under the Endangered Species Act (ESA) is maintained or restored on NFS lands, thus contributing to species recovery or delisting. Ecological conditions and processes that sustain the habitats currently or potentially occupied by sensitive plant species are retained or restored. The geographic distributions of sensitive plant species in the Forest Plan area are maintained.

- FW-GDL-VEG-07. (Guideline) Evaluate proposed management activities and project areas for the presence of occupied or suitable habitat for any plant species listed under the Endangered Species Act or on the regional sensitive species list. If needed, based on pre-field review, conduct field surveys and provide mitigation or protection to maintain occurrences or habitats that are important for species sustainability.

Along with managing for TES species as outlined above, the 2015 IPNF Forest Plan, following the 2008 planning rule and directives (FSH 1909.12, Chapter 40), also identifies forest species of concern (FSOC). FSOC are species for which there is concern at the planning (e.g., forest) level, even though they are considered secure at larger scales (e.g., regional, global); they are identified based on criteria outlined in FSM 1909.12_40, 43.22b and 43.22c. Although the 2015 IPNF Forest Plan has no direction regarding their management, in adherence with NFMA, FSOC are targeted during surveys, documented and reported when found, and addressed in environmental documents. No determination category is required for FSOC; however, effects are analyzed and described in a similar manner as for TES plants, without using the specific determination language reserved for the latter. No FSOC plants were observed during project surveys and they are not discussed further in this analysis.

Methodology

The objective of this analysis is to measure potential effects of the Proposed Action and No Action alternatives to IPNF TES plants (see Appendix 1 for species list). Effects are evaluated based on field surveys, presence of plant occurrences and suitable habitat, and the expected responses of each species to the proposed activities. The indicators and measures described below in Table 1 are used to roughly quantify anticipated effects.

Spatial and temporal contexts for analysis

The spatial boundary for analyzing cumulative effects to TES plants is the project boundary, since direct and indirect effects of proposed activities would interact with those of the past, present, and reasonably foreseeable future within this area.

The temporal boundaries for short-term cumulative effects range from time of implementation to five to eight years after project completion, depending on the implementation schedule for the actions (i.e., if certain stages of the project were delayed, then short-term effects would be drawn out longer); after this time, short-term effects diminish. Long-term effects may still be apparent ten or more years following

implementation. While some effects from proposed activities may still be apparent after 50 or more years, predicting effects to botanical resources beyond this time frame is unreliable.

Indicators, measures, and degree of effects

The following analysis indicators listed in Table 1 are used to measure the differences between the Proposed Action and No Action alternatives:

Table 1. Botany indicators and measures for assessing effects

Resource Indicator	Measure	Used to address P/N or key issue?	Source
Sensitive plant occurrences	Number of occurrences affected	No	BMPs, design features
Sensitive plant habitats	Acres of sensitive plant habitat affected (i.e., of soil disturbance and/ or changes in canopy cover)	No	BMPs, design features
Sensitive species' responses to proposed activities	Determination category for Sensitive and plants	No	Information sources described below

These indicators and measures can be used to assess impacts to sensitive plants because canopy structure and cover, soil nutrient composition and structure, and associated moisture regimes—which would be altered by the proposed activities—are important variables influencing the presence/ absence of suitable habitat for many IPNF sensitive species. For instance, the maintenance of below-ground networks of soil mycorrhizae (connections between plant roots and soil fungi) are critical to plants like orchids and moonworts, several species of which are current IPNF sensitive species and FSOC (Ahlenslager and Potash 2007, Lichthardt 2003). Similarly, certain degrees of canopy cover and the ongoing input of coarse woody debris in various stages of decay (i.e., rotten logs and stumps) are necessary for the creation and maintenance of the shaded, humid conditions essential for mosses like Green bug-on-a-stick and Clear moss (Harpel and Holmberg 2005, Montana Natural Heritage Program 2019).

Degree of impact is defined as very low to high, depending on whether or not any measurable effects would take place, the scale at which impacts would occur (individual, population, or habitat-level), and whether or not these would likely affect long-term habitat capability or populations (Table 2).

Table 2. Terminology used to describe magnitude of effects

Degree of impact	Description
Very low	No measurable effect on individuals, populations, or habitat.
Low	Individuals, populations, and/ or habitat not likely affected.
Moderate	Individuals and/ or habitat may be affected, but populations would not be affected. Over the long term, habitat capability would not be reduced to below a level that could not support sensitive plant species.
High	Populations may be affected and/ or habitat capability would be reduced to below a level that could support sensitive plant species.

Determination categories

The Proposed Action and No Action alternatives are evaluated to determine the level of potential effect to T&E and R1 sensitive plant species. One of four possible determinations of level of effect is chosen, based on analysis of potential effects of the proposed project (as characterized by indicators and measures, Table 1), best available science concerning species' responses to these effects, and professional judgement of the botanists who completed the evaluation.

Determination categories used for federally listed threatened and endangered species are:

- No effect (NE)
- Beneficial effect (BE)
- May affect, not likely to adversely affect
- May affect, likely to adversely affect

Determination categories (from FSM 2672.42) for R1 sensitive plants are:

- No impact (NI)
- Beneficial impact (BI)
- May impact individuals or habitat, but will not likely contribute to a trend towards federal listing or cause a loss of viability to the population or species (MIIH)
- Will impact individuals or habitat with a consequence that the action may contribute to a trend toward federal listing or cause a loss of viability to the population or species (WIIH)

Sources of information

Sensitive plant habitat guild model

R1 sensitive and FSOC plant species have been assigned to one or more plant habitat guilds, which are associations or groupings of plants with similar habitat requirements, specifically: wet, moist, dry, and cold forest; and subalpine, deciduous/ riparian, peatland/ meadows, and aquatic habitats (Mousseaux 1998). The guilds are described in terms of characteristics such as elevation, topographic features, overall vegetation community, etc. They are useful analytical tools; for instance, the presence or absence of certain habitat guilds in a project area can be used to gauge how likely certain sensitive plant species are to occur there. Even if occurrences of certain species are not documented in a given habitat guild during surveys, the likelihood of their occurrence may nevertheless be considered high and a project's potential effects to these species would be evaluated.

Use of vegetation mapping data (Timber Stand Management Records System [TSMRS]) was used to identify habitat guilds in the project area and thus to identify 'target' species, i.e., likely to be in the project area. Habitat guild modeling provides a 'coarse filter,' predicting where in the project area sensitive plant habitat may occur. This helps to focus survey efforts, but also has its limitations. It is not fine-grained enough to identify micro-sites and other smaller scale sensitive plant habitats (e.g., seeps, springs, rock outcrops). At the same time, field surveys of areas identified as suitable by TSMRS indicate that this coarse filter query often overestimates the actual extent of suitable habitat. Finally, because our current understanding of the ecology of sensitive species is incomplete, sensitive plant occurrences may occur in unexpected places.

Other information sources

Other data sources used to identify sensitive plant occurrences and suitable sensitive plant habitat include aerial photos and topographical maps, Natural Resource Information System (NRIS) database for documented sensitive species occurrence distribution on NFS lands, Idaho Fish and Game Conservation Data Center (ICDC) database for element occurrence records (ICDC 2018), National Wetlands Inventory Maps, and relevant scientific information (e.g., concerning target species and/ or natural histories of the area).

Incomplete and unavailable information

There are limited data regarding the historical abundance and distribution of R1 sensitive plants within the Emerald project area. This is in part because, before 1988, TES surveys were not regularly conducted on NFS land and occurrence reports were sent only incidentally to the ICDC. Additionally, there are no TES survey data for the land held privately (~63 acres) and by Potlatch (~320 acres) in the project area.

Also, the population ecology of many species—and identification of factors underlying their survival—remains poorly understood (Halpern and Spies 1995). This makes it more difficult to evaluate the potential impacts of proposed activities. In some cases, informal observations are available, but these may not be generalizable. Fortunately, relevant scientific literature and monitoring reports—which provide an improved understanding of the relationship between natural and management-related habitat disturbance and the persistence of these species—exist for several of the Region 1 sensitive species, including Clustered lady's-slipper (Lichthardt 2003), Deerfern (Matthews 1993), Constance's bittercress and Henderson's sedge (Lichthardt 1997), Howell's gumweed (Lorain 1991), Idaho barren strawberry (Crawford 1980), and various moonwort species (Ahlenslager and Potash 2007, Beatty et al. 2003, Lorain 1990, Vanderhorst 1997).

Even with such data, it can be difficult to confidently quantify the effects to sensitive plant populations from disturbance events, whether natural or human-caused. Because species' ecological requirements vary, so does their ability to inhabit or reestablish themselves in areas following disturbance. For instance, in moist or wet sites, some moonwort species are frequently found in younger stands (e.g., 25 years old). By contrast, most other moist or wet habitat species (e.g., Naked Mnium moss, Green bug-on-a-stick moss, and Mountain moonwort) are associated with old growth forest and a specific distribution and composition of over- and understory that may take more than a century following timber harvest or fuels reduction to develop.

Affected Environment

Species and Habitat Descriptions

As directed by the Council on Environmental Quality (40 CFR 1502.2(b)), possible impacts are discussed in proportion to their significance.

Table 5 outlines the level of analysis conducted for TES plants for this project, based on consideration of their potential to occur within the project area and the potential for direct effects from implementation of proposed Emerald project activities. Detailed analysis and discussion for habitat and/or species considered present and/ or affected by proposed activities are found below.

Threatened and Endangered Plant Species

U.S. Fish and Wildlife Service currently lists two plant species as threatened for the IPNF: Water howellia (*Howellia aquatilis*) and Spalding's catchfly (*Silene spaldingii*). No species are listed as endangered for the IPNF at this time.

Neither species is documented as present in Latah, Benewah, or Shoshone Counties, but based on estimated range, they may occur on the IPNF (USDI 2019a, b). Water howellia is associated with shallow, vernal freshwater pools of wetlands, edges of larger ponds, and hydrologically active or abandoned river oxbows. Spalding's catchfly occurs chiefly in dry grassland habitats and grassland inclusions in ponderosa pine and Douglas-fir forest. Field botanical surveys for these species have been conducted in potentially suitable habitat on the IPNF; to date, no occurrences have been documented.

U.S. Fish and Wildlife Service currently lists Whitebark pine as a candidate for federal listing. Given this status, the Regional Forester designated Whitebark pine as a sensitive species and it is treated as such in this analysis. Whitebark pine is associated with alpine and sub-alpine habitat; because there is no sub-alpine or alpine habitat in the project area, Whitebark pine is not discussed further in this analysis.

Field botanical surveys for threatened plant species were conducted in areas of proposed activities within the Emerald project area. No occurrences of, or suitable habitat for, either threatened species were detected. As there would be no effect to federally listed plants from activities proposed for this project, these species are not analyzed in detail in this report. As there are currently no endangered plant species currently listed for the IPNF; these are dismissed from further analysis.

Sensitive Species

Floristic surveys were conducted in the Emerald project area in 2006, 2018, and 2019; copies of botanical surveys are included in the project record. Fourteen occurrences of three species (Clear moss, Naked Mnium moss, and Deer fern) were documented in the project area in 2006, prior to 2018-19 fieldwork for this project (ICDC 2018). Additionally, one FSOC (Forest Species of Concern), Phantom orchid (*Cephalanthera austiniae*), is documented within the project area (outside of proposed activity areas). All of these occurrences are located outside of proposed activity areas.

Error! Reference source not found. shows modeled rare plant habitat within the project area; Figure 2 shows areas of overlap between proposed treatment units, temporary and new roads, and this habitat. Intensive surveys were conducted in high quality habitat within units where ground disturbance is proposed (including vegetation treatment units, roads to be decommissioned or stored, and proposed sites for road construction and reconstruction). Cursory to general surveys were conducted in other units to assess the potential for sensitive plant occurrences and to identify any microsites that might support such species.

An inventory of all plant species encountered was recorded, including target sensitive species associated with habitat guilds present in the project area and non-native, invasive species (see Appendices 1–3 for species lists). During surveys, one sensitive plant population of Triangle moonwort (*Botrychium lanceolatum*) was documented along an intermittent tributary/ seep (wet at time of survey) of East Fork Emerald Creek in a forested area of Western red cedar and western hemlock with an understory of lady fern (*Athyrium filix-femina*), bunchberry dogwood (*Cornus Canadensis*), wild ginger (*Asarum caudatum*), goldthread (*Coptis occidentalis*), and cool-wort foam flower (*Tiarella trifoliata*).

At the time of survey, the Triangle moonwort occurrence was located within a proposed treatment unit. Since then, unit boundaries have been modified and the riparian area and sensitive species occurrence

excluded by a 100-foot buffer; to avoid accidental disturbance, the occurrence would also be flagged for visibility.

At the global level, NatureServe presently ranks Triangle moonwort as a G5 species: “Secure—Common; widespread and abundant,” but because of the typically small population sizes and particular micro-site requirements, it is considered rare where it occurs. At the subnational level, in Idaho, it is ranked SNR: “State Unranked” (NatureServe 2018). To date, 81 Triangle moonwort occurrences have been documented on the IPNF, where this species is generally associated with moist and wet forest habitat and disturbance cycles of 10 to 30 years.

Figure 1. Total estimated sensitive plant habitat in the Emerald project area

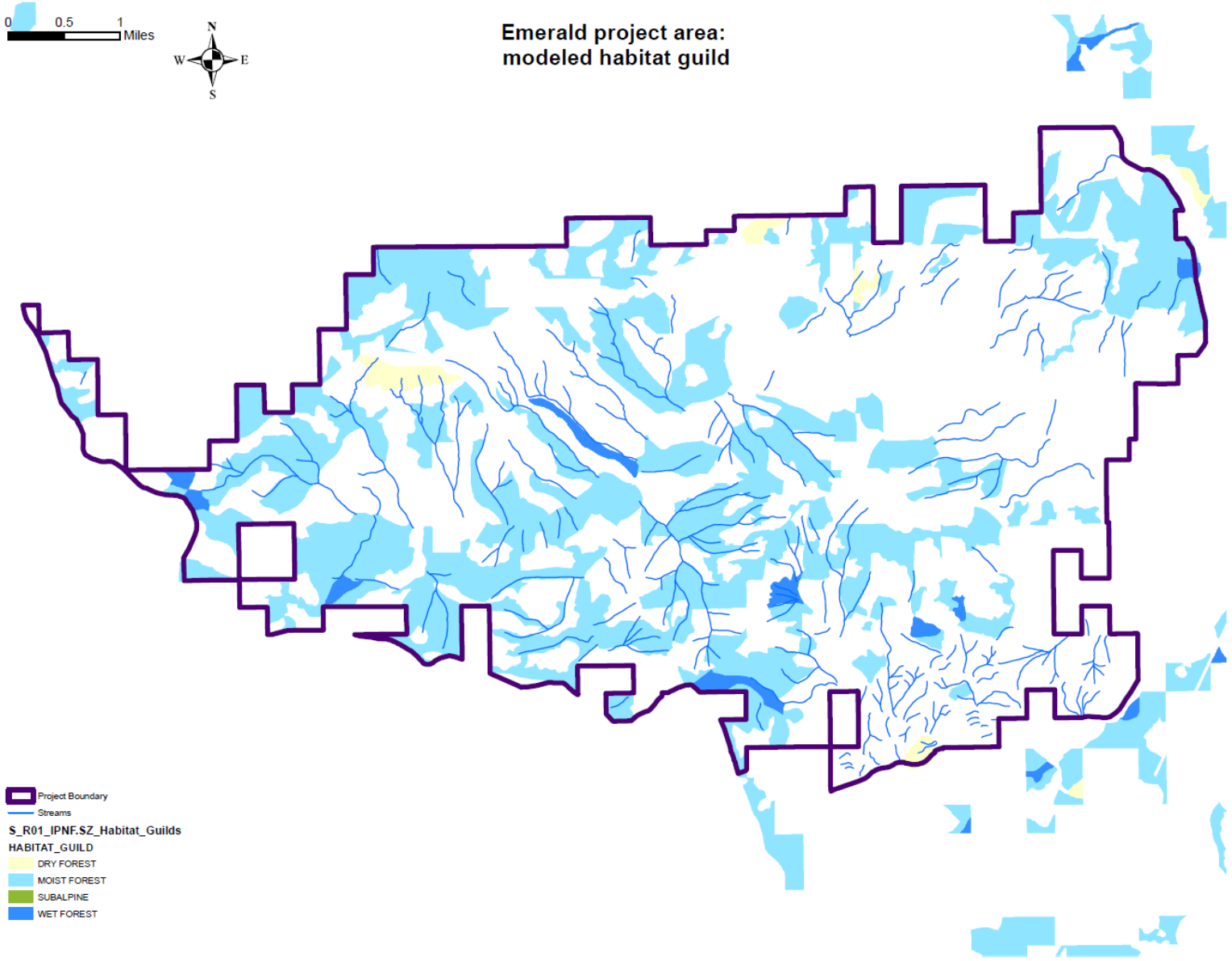


Figure 2. Proposed treatment units and affected sensitive plant habitat

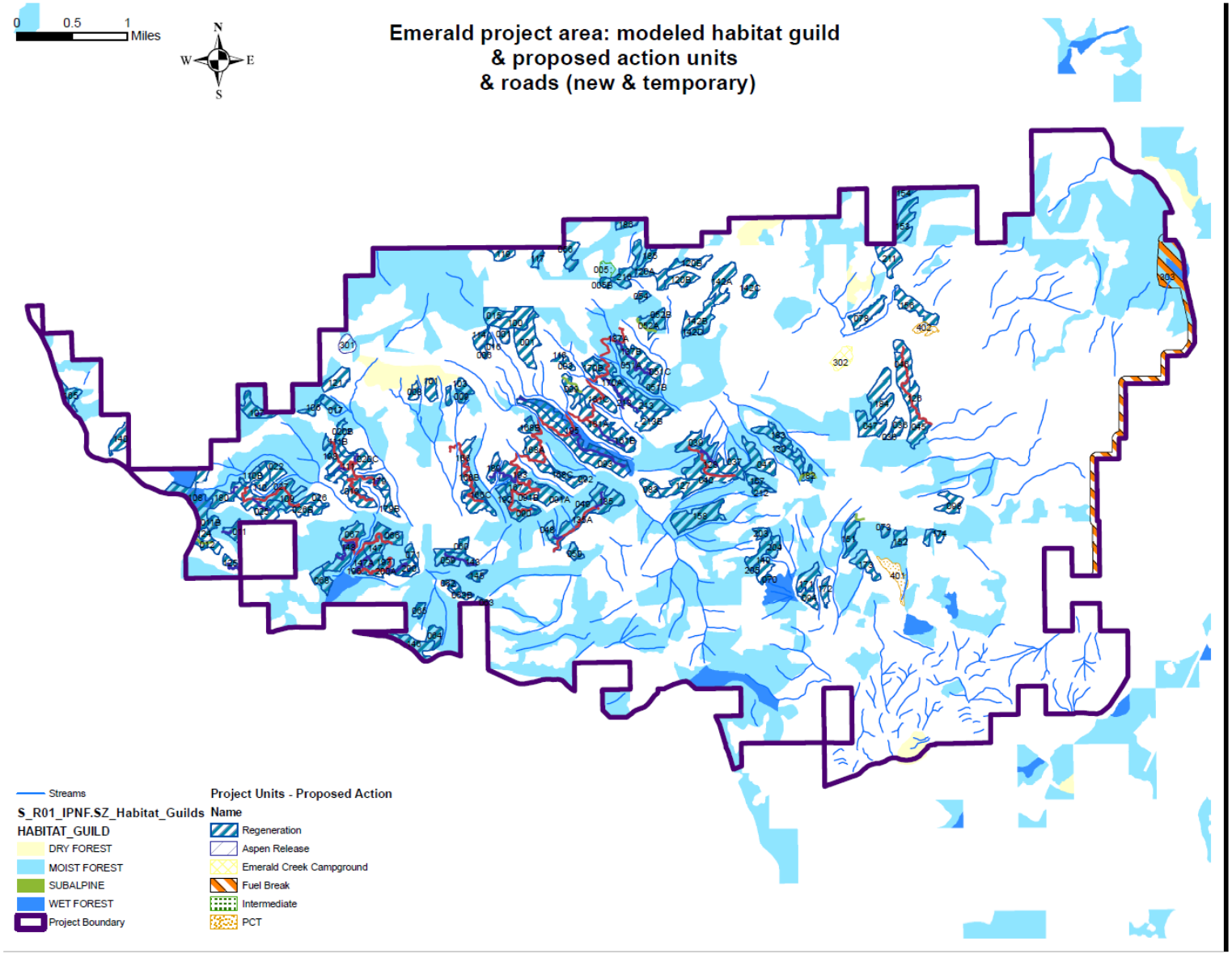
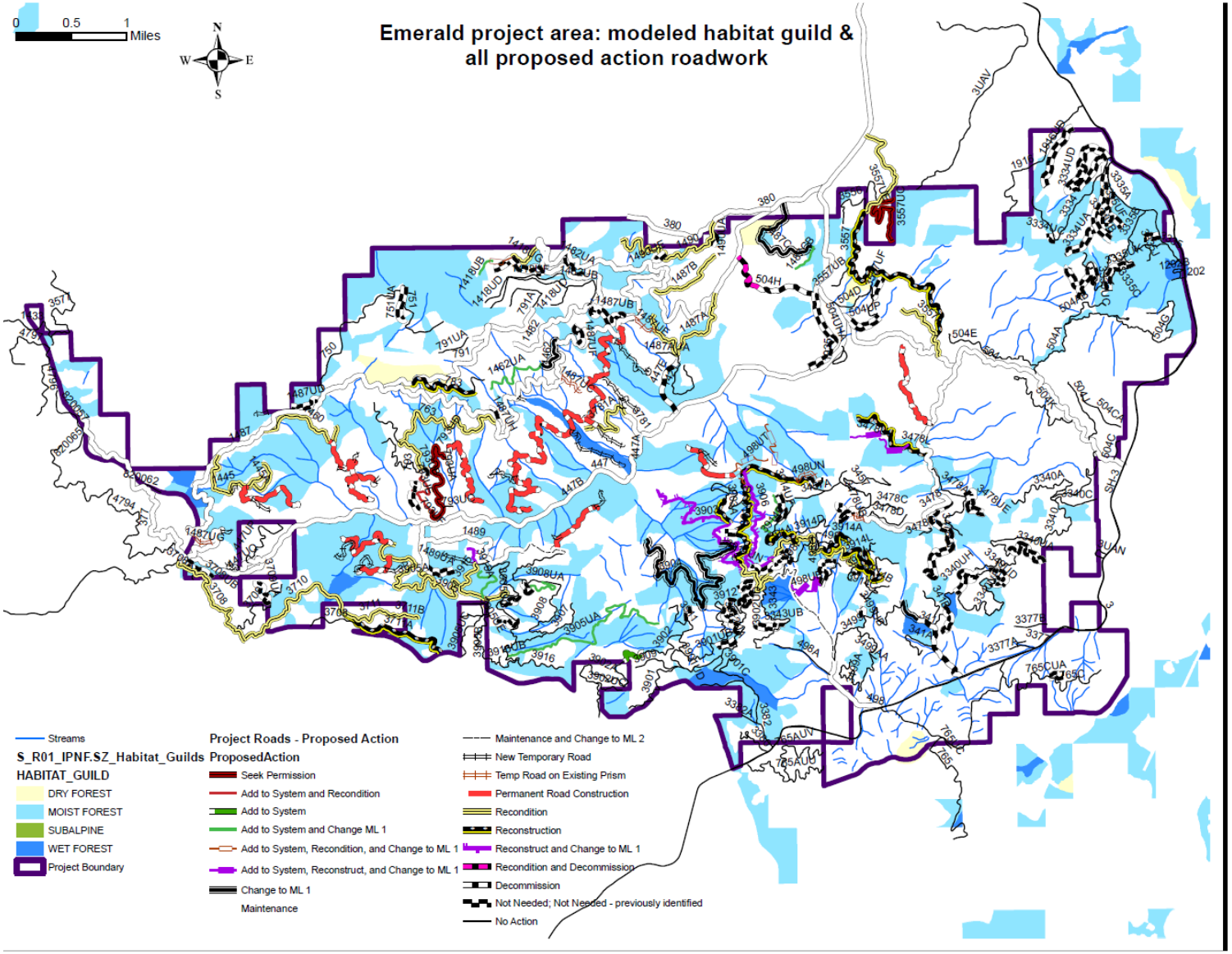


Figure 3. Roadwork associated with Proposed Action



Habitat Guilds and Species Analyzed

As noted above, sensitive species are those for which population viability is a concern, based on current or predicted downward trends in numbers, distribution, and/ or habitat quality. Currently, thirty-two sensitive plant species are known or suspected to occur on the St. Joe RD (USDA 2011).

As depicted in Tables 3–5, the project area totals 21,627 acres and includes 7,442 acres of sensitive plant habitat—predominantly moist forest. Proposed treatment areas (units and associated roadwork) total 2,553 acres and include 1,223 acres of sensitive plant habitat (~16% of the total sensitive plant habitat in the project area).

Where no effects are expected, associated species are not analyzed further; where effects are possible, analysis is conducted for associated species. The following analysis therefore focuses on the 22 species associated with the moist and wet forest guilds (Table 5).

Table 3. Botany indicators and measures for the existing condition

Resource indicator	Resource measure	Existing condition	Notes
Sensitive plant occurrences	# occurrences previously documented	- 11 Naked Mnium moss - 2 Deer fern - 1 Clear moss	14 occurrences
	# occurrences documented during project surveys	Triangle moonwort	1 occurrence
Sensitive plant habitat	Total estimated acres in project area	Moist forest	6969 acres
		Wet forest	277 acres
		Dry forest	196 acres
		Total	7442 acres
Acres sensitive plant habitat affected by Proposed Action	Total acres ***in*** proposed units & areas of roadwork	Moist forest	1152 acres
		Wet forest	67 acres
		Dry forest	3 acres
		Total	1223 acres

Table 4. Distribution of sensitive plant habitat relative to proposed units (see also Figs. 1 & 2)

	Acres
Project area acreage	21627
Total acres modeled sensitive plant habitat in project area	7442
Total proposed units	2553
Proposed areas of activity ***with*** sensitive plant habitat	1223
Proposed areas of activity ***without*** sensitive plant habitat	1330

Table 5. TES habitat guilds & species analyzed (see Appendices 5 & 6 for habitat requirements)

	No detailed analysis or discussion warranted; species/ habitat not present within project area	Supporting rationale presented in this section for species and/ or habitat present in project area, but not affected by proposed activities or no action. No detailed analysis necessary	Species and/ or habitat considered present and potentially affected by proposed activities or no action are carried forward for further analysis/ discussion
Federally listed species			
Howellia aquatilis	X		
Silene spaldingii	X		
Region 1 Sensitive Species grouped by habitat guild association			
Aquatic	X		
Cold forest	X		
Deciduous riparian	X		
Peatland	X		
Subalpine	X		
Dry forest		X	
Moist forest			X
Wet forest			X

Existing Condition

The project area is composed mainly of moist and wet forest habitat, along with a few small areas of dry forest habitat; elevation ranges from approximately 2,800 feet to 4,665 feet above sea level. The moist and wet forest areas are currently characterized by a closed canopy; dry forest habitat has a more open canopy interspersed with grassy areas. As discussed above, the 21,627-acre project area includes fifteen documented wet/ moist forest sensitive species occurrences, along with 7,442 acres of modeled high quality habitat, suggesting that there may be more (undocumented) sensitive plants in the project area.

Desired Condition

The current 2015 IPNF Forest Plan calls for avoiding negative impacts to existing TES plants and for the maintenance of suitable habitat for these and a diversity of plant species; see the "Regulatory Framework" section of this report (p. 2).

Environmental consequences

No Action Alternative

In the case of the No Action alternative, the proposed vegetation treatments and associated roadwork would not take place; ongoing and future authorized land management activities would occur as planned.

Direct and indirect effects of No Action alternative

Because none of the proposed activities would take place, the No Action alternative would have no direct impacts on sensitive plants or their habitat.

Indirect effects of the No Action alternative to sensitive plant habitat and populations would include heightened risks associated with increased fuel loads over time as a result of fire suppression. In this case, if a wildfire started in the project area, accumulated fuels could contribute to a high-intensity fire resulting in loss of sensitive plant individuals and suitable habitat—versus a lower-intensity fire that more closely mimics historical fire cycles of 10- to 30-years and to which native species would be adapted (and that therefore might be beneficial). Fire suppression activities (machinery, fire lines, etc.) could also act as vectors to introduce weeds, which would be able to establish themselves in the disturbed, open soils.

Lack of fire (i.e., continued fire suppression) and consequent increased canopy cover and more densely stocked forests associated with the No Action alternative might indirectly reduce suitable habitat for certain (though not all) sensitive species over time. For instance, historical 10- to 30-year cycles of fire created forest structure and composition suitable for several of the St. Joe sensitive species (including all but one of the ten sensitive moonworts). However, natural disturbances (lightning strikes, small-scale fires, storms downing trees, disease, seasonal riparian flooding, etc.) would continue to provide micro-site disturbances. Furthermore, species associated with mature/ old growth western redcedar would not require such disturbance for the creation or maintenance of their habitat (Ahlenslager and Potash 2007, Fulkerson et al. 2017, Zika et al. 1995). See Appendix 3 for a discussion of moist- and wet-forest associates, their habitat requirements, and likely responses to disturbance.

Proposed Action

As summarized in Tables 6–8, the Emerald project proposes vegetation treatments for 2,553 acres (~12%) of the ~21,631-acre project area. Proposed activities include regeneration harvest (2,478 acres) and site preparation to plant desired trees species, e.g., through slashing/ piling and burning slash piles and prescribed burning. Additionally, various types of roadwork would be conducted to permit access to and hauling of logs from units—including the construction of new and temporary roads, road maintenance, reconditioning, and reconstruction; a gravel pit would be expanded to provide material for roadwork (Figure 3, below, shows all types of roadwork associated with the Proposed Action). Restoration activities include road storage/ decommissioning to improve aquatic habitat and stream conditions along the East Fork of Emerald Creek and 12 acres of aspen release (from encroaching conifers) in the northern part of the project area. See the Emerald EA for description of the purpose and need and Proposed Action.

Table 6. Proposed Action timber harvest & logging systems

Activity	Type	Quantity
Silvicultural treatments	Regeneration harvest	2,478
	Intermediate harvest	30
	Pre-commercial thin	32
	Aspen release	12
Total treatment acres		**2,553 acres**
Logging systems for regeneration harvest	Ground-based	696
	Cable	747
	TLM	1,035
Total		**2,478 acres**

Table 7. Proposed Action silvicultural treatments[1]

Proposed activity		Acres	% Project area
Regeneration harvest[2]	Clear cut: average 5-10 trees/acre left standing	2,478	11.4
	Shelterwood: average 30-40 trees/acre left standing		
Intermediate harvest	Treatments to improve growth, quality, vigor, and composition of stand	30	0.14
Pre-commercial thinning	Treatments to reduce stand density	32	0.14
Aspen release	Removal of conifers	12	0.06
Fuel reduction	E.g., piling/ burning, prescribed burning	188	0.87
Total		**2,553**	

Table 8. Proposed Action roadwork

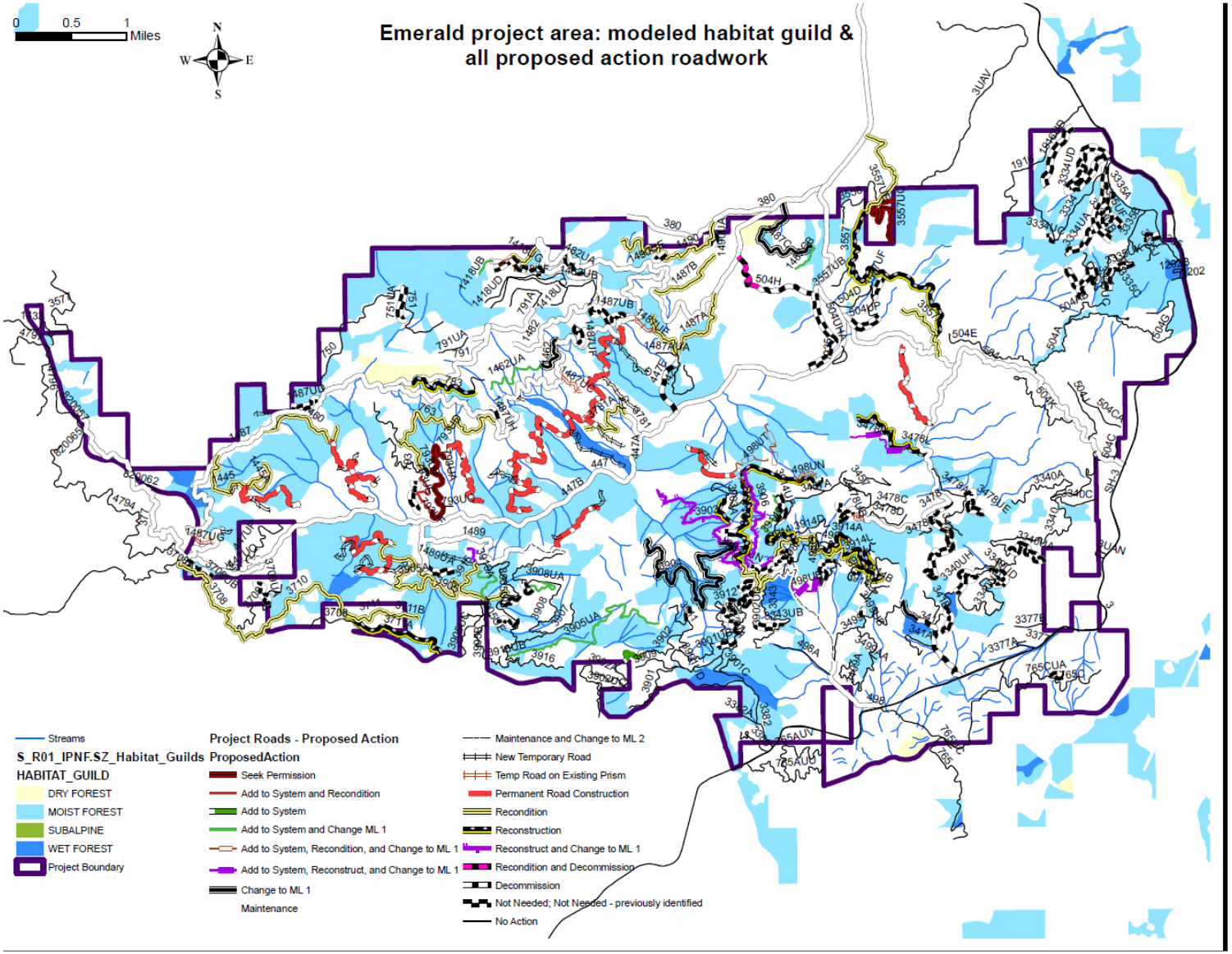
Activity description	GIS miles	Notes
Maintenance	47.3	Clearing brush, cleaning/ adding culverts/ drainage structures, road blading/ shaping, adding road surface aggregate
Reconditioning	22.4	Similar to maintenance, but more intensive work required
Reconstruction	15.3	Minor road realignment, widening, addition of turnouts, along with maintenance activities. Reconstructed roads would be closed within 3 years of project completion
Temporary road construction (new)	6.9	Re-contoured or obliterated within 3 years of project completion[3]
Temporary road construction (existing prism)	1.1	Re-contoured or obliterated within 3 years of project completion
New system road construction	11.9	Front-end obliteration and placement in storage following project completion
Road storage	1.4	To improve water quality
Road decommissioning	2.0	To improve water quality

[1] Glossary of terms: https://www.fs.fed.us/restoration/reforestation/glossary.shtml

[2] Emerald Silviculture report, p. 17

[3] Full project completion is estimated at 10-15 years (e.g., 6 years contracts for larger timber sales, 5 years for burning/ planting, and then a few years for road closure)

Figure 3. Roadwork associated with the Proposed Action



Design features associated with Proposed Action

A single new sensitive plant occurrence was documented within an intermittent seep/ stream by ERG during the 2018 surveys. At the time of survey, it was located within a proposed unit; the unit has since been modified to exclude the riparian area by 100 feet (from the southwestern boundary of Unit 26b) and therefore also the sensitive plant occurrence within it. Additionally, the occurrence is over 500 feet from a proposed new road construction bisecting Units 25 and 26. Consequently, there are no concerns regarding direct impacts from proposed activities.

# occ.	Species	Location	Design feature
1	Triangle moonwort (*Botrychium lanceolatum*)	100+ ft. SW of boundary of Unit 26B in intermittent seep/ stream	Buffer/ flag for visibility/ avoidance No concerns as occurrence within 100' riparian buffer (100+ ft. from unit boundary) & 500+ ft. from proposed permanent road construction

The fourteen previously documented sensitive plant occurrences (Clear moss, Naked Mnium moss, and Deer fern) aren also located outside of proposed activity areas; see Table 3. As a result, no documented R1 sensitive plant occurrences would be directly affected by the Proposed Action.

In the case of any additional TES plant occurrences found during project implementation, an agency botanist would be contacted and appropriate management prescriptions determined; these might include:

- Modifying activity methods to protect sensitive plants and their habitats or otherwise modifying the proposed activity, and/ or
- Implementing spatial buffers around plant occurrences

Provisions for the protection of endangered species and settlement for environmental cancellation would be included in all contracts as specified under Timber Sale Contract provisions B6.24, Protection Measures Needed for Plants, Animals, Cultural Resources, and Cave Resources; C6.24#- Site Specific Special Protection Measures; and B8.33, Contract Suspension and Modification.

Direct and Indirect Effects

As noted, the project area includes an estimated 7,442 acres of suitable habitat for sensitive plants. In addition to these modeled acres, the documentation of 15 sensitive plant occurrences within the project boundary attests to the suitability of portions of this area for certain sensitive species.

Direct Effects

Undetected sensitive plant occurrences may be directly impacted by being directly crushed or killed by soil and vegetation removal, timber removal equipment and personnel, and disturbances associated with the various types of roadwork. Undetected annual plants that experience disturbance prior to seed set may experience subsequent decreased viability as a consequence of a reduced seed bank. Perennial plants may experience ground disturbance to rootstocks (rhizomes, taproots, and bulbs), potentially inhibiting the plants' ability to re-sprout from rootstock.

The fifteen sensitive plant occurrences documented within the project area are located outside of treatment units and would therefore be out of danger of direct effects. The single new occurrence documented during project surveys would be protected because unit boundaries were modified during the NEPA process to exclude/ buffer the riparian area and sensitive plant occurrence by 100 feet. Any new occurrences identified during implementation would be assessed and protected via spatial or temporal buffers or other means.

Indirect Effects

Indirect effects refer to changes to sensitive plant habitat as a result of canopy removal and soil disturbance. The consequences of these changes for sensitive plants (i.e., to their ability to persist on the

landscape) will depend on the specifics of the disturbance (e.g., extent, intensity, and frequency) on the one hand, and species' inherent tolerance to disturbance, on the other.

Species' disturbance tolerance

Appendix 4 summarizes available data regarding habitat requirements and disturbance tolerance for the 22 moist, wet, and dry forest habitat sensitive species. Based on these data, we can divide the sensitive species into 1) twelve species for which some level of disturbance can be beneficial (contingent on scale, intensity, and frequency); 2) eight species for which disturbance is not beneficial; and 3) two species for which there are conflicting or insufficient data.

Moist/ wet forest-associated sensitive species that fall into the disturbance-intolerant category include: Mountain moonwort, Maidenhair spleenwort, Clustered lady's slipper, Britton's grimmia moss, Sierra woodfern, Chickweed monkeyflower, along with two of the three species documented in the project area: Clear moss and Naked Mnium moss. These species are associated with shaded, humid, mature/ old growth forested areas with continued input of decaying wood—and with micro-sites like rock cliffs and outcrops or seeps within moist and wet forest habitat.

On the other hand, moist/ wet forest sensitive species that are disturbance-tolerant include two of the species documented in the project area: Deer fern and Triangle moonwort. Additionally, nine other moonwort species fall into this category. Once short-term impacts dissipate, such species may benefit from the Proposed Action insofar as it moves forest composition and structure toward the desired condition.

Two other moist forest species, Constance's bittercress and Idaho barren strawberry, *may* benefit from some level of disturbance. However, further data are necessary in order to clarify the degree and types of disturbance that can be beneficial and the interrelationship of disturbance with other factors in determining these species' success (Lichthardt and Moseley 1994).

Physical disruption of the understory community through project treatments may eliminate species that are disturbance intolerant, especially if they have low resilience to logging-related disturbance. Frequent and intense disturbance may favor disturbance-tolerant species and result in a decrease in species with low dispersal rates (Halpern and Spies 1995).

Howell's gumweed is the only St. Joe sensitive species found exclusively in dry forest habitat. It occurs on the St. Joe RD in a grassy, open area interspersed with Ponderosa pine. Additionally, Lorain (1991) describes an occurrence in Idaho on a grassy, open bluff surrounded by mixed conifer forests, as well as non-timbered openings in direct sunlight or in semi-shaded communities with ponderosa pine. The dry forest habitat in the treatment units do not support this type of habitat. Because of the lack of these potential habitat descriptions and the lack of occurrences observed during 2018 surveys, it is unlikely that Howell's gumweed exists within proposed units.

Clustered lady's slipper and Chickweed monkey flower also occur in dry forest habitat (in addition to moist and wet forest, as discussed above). Approximately 3 acres of dry forest habitat is proposed to be treated by tractor-swing logging. Because the scale of disturbance would be so low (0.04% of total modeled sensitive plant habitat; 1.5% of the total dry forest habitat in project area), effects would be so small as to be insignificant. Therefore, these two species are only analyzed in terms of effects to their moist and wet forest habitat.

Habitat change resulting from the Proposed Action

Table 6-8 outline the specific activities proposed in the Emerald project area. Of the 2,553 acres proposed for timber harvest, 1,223 acres are considered sensitive plant habitat. These 1,223 acres represent c. 16% of the total 7,442 acres of sensitive plant habitat; with the Proposed Action, 6,219 acres (c. 84% of the total) modeled sensitive plant habitat in the project area would remain untreated (under existing conditions).

Canopy removal associated with the Proposed Action

Canopy removal results in decreased shade and site humidity and increased soil and air temperatures, setting the stage for changes in plant community composition. Pioneer species tolerant of sunnier, hotter, and more arid conditions (and disturbed soils, discussed in the section below) include some native species—but are mostly non-native, invasive weeds (see the Weed Risk Analysis [WRA] for the Emerald project. Because the project area and proposed units are predominantly comprised of moist and wet forest, associated native species are adapted to shadier, cooler, and more humid later seral conditions.

As shown in Tables 6-7, the majority of proposed treatment would be regeneration harvest (2,478 of 2,553 acres), meaning that 5-10 (clearcut) or 30-40 (shelterwood) trees would be left standing per treated acre (project Silviculture report, p. 17-18). With either method (clearcut or shelterwood), in the short-term (until native vegetation re-establishes), shade would be reduced substantially for these 2,478 acres and soil and air temperatures and humidity increased. The more clearcut than shelterwood treatment takes place, the greater the magnitude of such changes and the less favorable conditions would be for moist-wet forest species.

An additional factor influencing the degree of habitat change is that 1,343 of the 2,553 acres (c. 53%) would be treated in blocks greater than 40 acres. The 40+ acre-openings range in size from 42 to 635 acres (Silviculture report, p. 17-18). To a certain degree, individual and groups of trees left standing in regeneration units (Tables 6-7) would counter the severity of such large expanses of sunny, hot, dry conditions, providing ‘micro-habitats' of shade during parts of the day.

Overall, while the degree of habitat alteration would vary depending on the type of regeneration harvest and the size of the area treated, in the short-term, canopy removal resulting from the Proposed Action would indirectly negatively affect habitat suitability for native plants adapted to later seral stages of moist-wet forest, including several sensitive species.

Habitat vulnerability would remain high in treated areas until regenerated native shrubs and planted trees are big enough to begin shading-out weeds and reestablishing conditions more favorable for native herbaceous species. Nevertheless, low densities of weeds would likely remain among reemerging native plant communities, given the current weed treatment strategy focusing on priority weeds, campsites, and roadsides; see project WRA.

Soil disturbance associated with the Proposed Action

In addition to decreased suitability for moist-wet forest native plants, including sensitive species, resulting from canopy removal, soil disturbance caused by the proposed activities would also create indirect, negative impacts in the short term.

As discussed in the Emerald WRA, pioneer plant species (native, but primarily non-native) thrive in disturbed soils (and hot, sunny conditions), giving them a competitive advantage over later seral species. Non-native, invasive species (weeds) are often inadvertently introduced by machinery and vehicles (e.g., such as that used in logging and roadwork).

While project design features would require the effective cleaning of all equipment and tools used in the Proposed Action (see EA), such measures mitigate (reduce the incidence of), but do not eliminate, the introduction and spread of weeds.

Soil displacement and compaction and changes in soil hydrology could also negatively affect habitat for certain native plant species. Some degree of soil compaction would occur as a result of the Proposed Action (e.g., along roads, skid trails, and other areas where machinery is driven and/ or stationed). Changes in soil hydrology, i.e., resulting from the removal of large quantities of vegetation and soil compaction would also change micro-site conditions. Such changes can alter current and future success of certain understory plants due to mortality, reduction in future recruitment, changed soil moisture, and lost or disrupted mycorrhizal connections (which are critical to orchids and moonworts, including several sensitive species).

Design features of the Proposed Action related to soils would minimize soil displacement and compaction. Also, some sensitive species—including nine of the sensitive moonworts—are not negatively impacted by soil compaction. Rather, these moonwort species occur in compacted soils associated with "parking lots, picnic and camping areas, road sides (in cracks and gravel in asphalt)." Donald Farrar of Iowa State University, a specialist in moonworts, has also concluded that, "Soil compaction is often listed as a threat, but I don't think that it really is a problem" (Ahlenslager and Potash 2007).

Proposed yarding systems

Degree of soil disturbance and compaction would vary with the yarding mechanisms employed; specifically, skyline yarding is less harmful than ground-based yarding. For the Proposed Action, two types of skyline yarding would be used for c. 72% of regeneration harvest: track line machine (42%, 1,035 acres) and cable yarding (30%, 747 acres). In the case of track line machine yarding (TLM), the track line machine is moved into the unit (usually along a ridge) and then skyline logging takes place from this machine (versus building a temporary road to access the unit); cable yarding relies on road access.

Use of skyline (TLM and cable) yarding for 72% of the proposed timber harvest would reduce the overall magnitude of impacts related to soil disturbance and compaction. The remaining 696 proposed treatment acres (28%) would be yarded using the more intensive ground-based methods.

Proposed roadwork

Various types of roadwork with similar degrees of potential impact are proposed for the Emerald project area (Figures 2-3, Table 6).

Table 8. Proposed Action roadwork

Activity description	GIS miles	Notes
Maintenance	47.3	Clearing brush, cleaning/ adding culverts/ drainage structures, road blading/ shaping, adding road surface aggregate
Reconditioning	22.4	Similar to maintenance, but more intensive work required
Reconstruction	15.3	Minor road realignment, widening, addition of turnouts, along with maintenance activities. Reconstructed roads would be closed within 3 years of project completion
Temporary road construction (new)	6.9	Re-contoured or obliterated within 3 years of project completion[4]
Temporary road construction (existing prism)	1.1	Re-contoured or obliterated within 3 years of project completion
New system road construction	11.9	Front-end obliteration and placement in storage following project completion
Road storage	1.4	To improve water quality
Road decommissioning	2.0	To improve water quality

Road maintenance, reconditioning, and reconstruction represent the least amount of soil disturbance and canopy removal (see Table 8 "Notes"). The construction of c. 18 new system roads and new temporary roads entails removal of native vegetation and disturbance of soils in undisturbed tracts of forest. Construction of approximately one mile of temporary roads from existing prisms means that vegetation

[4] Full project completion is estimated at 10-15 years (e.g., 6 years contracts for larger timber sales, 5 years for burning/ planting, and then a few years for road closure)

removal and soil disturbance would occur along a previously disturbed tract, where native vegetation had recovered to a certain extent.

As shown in Table 8, reconstructed (c. 15 miles), new and existing temporary roads (8 miles), and new system roads (c. 12 miles) would be closed, re-contoured or obliterated, and obliterated and placed in storage (respectively), within three years of project completion (i.e., in c. 10-15 years). Accordingly, the miles of new and temporary roads represent a short-term loss of habitat for native plants (including sensitive species).

The construction and subsequent use of roads provide opportunities for weed encroachment (despite design features that would reduce, but not eliminate, incidence of weed introduction/ spread; see project WRA). In the case of roads ultimately closed following project completion, introduced weeds may persist after their closing (at least at low levels). In this way, the indirect impacts to habitat (i.e., plant community composition and associated competition between non-native, invasive and native plant species) last longer than the life of the road. No known locations of sensitive plants occur within 330 feet of the roadways in the proposed project area.

With respect to time frame, indirect impacts to habitat would be most acute 10–30 years following project implementation—until the regenerating tree canopy begins to provide shade and other associated conditions necessary favoring sensitive plant species' return. Other elements of sensitive plant habitat may not return for over 50 years—for instance, conditions associated with mature forest stands.

Cumulative Effects Discussion

Past, ongoing, and reasonably foreseeable future actions

The project area is the site of various past, ongoing, and reasonably foreseeable activities—on NFS, state, and private land—which are facilitated by an existing circa 179-mile road system.

Activities on NFS land include past timber harvests associated with the Hidden Cedar FEIS (2002), as well as pruning, planting, non-commercial thinning, and related activities authorized by the St. Joe Timber Stand Improvement DMs (USDA 2012, 2014). Additionally, ongoing activities include garnet mining associated with the Emerald Creek Garnet Area EIS (USDA 2006); and livestock grazing under the St. Maries Basin Grazing Allotment DN (USDA 2005).

In terms of grazing, most of the Emerald Creek Allotment occurs in the project area (~14,757 of the 15,066 acres on NFS land. One permittee grazes a maximum of forty-one cow-calf pairs from ~6/15–10/15 each year in this allotment. The Emerald Creek Allotment encompasses multiple jurisdictions: private (belonging to the permittee), Idaho Department of Lands, Potlatch, and NFS. As discussed in the Weed Risk Assessment for the Emerald project, cattle can move across jurisdictions, so that weed management by the different entities has implications for the entire area.

Ongoing recreational activities include visits to the Emerald Creek Garnet Area for garnet 'collecting' (from gravel panels excavated under the Emerald Creek Garnet Area EIS), camping at dispersed and developed sites (Emerald Creek Campground), hunting, fishing, and trail use (primarily motorized). Firewood cutting is also an important activity for the public.

The NEPA process is used to evaluate the potential effects of all such activities on NFS land. Sensitive plant habitat assessment is conducted for all ground and/ or vegetation-disturbing activities on the St. Joe RD. Although some individual sensitive plants may be impacted, overall, cumulative impacts to sensitive plants/ habitat from the range of activities taking place are expected to be low.

The Forest Service has no influence on activities taking place on the ~391 acres private and state land within the project area. Of the 391 acres non-NFS land in the project area, 320 acres belong to Potlatch, 63 acres to another owner, and eight acres to the state. Because there are no reference data for sensitive plants on private land (i.e., species present, number of occurrences, geographic location, condition) and no policies in place to afford sensitive plants protection, it is difficult to know the degree to which

activities there affect sensitive plant populations on NFS land. National Agriculture Imagery Program (NAIP) data from 2004 and 2017 indicate that the majority of this land was logged during this time span (USDA 2017, 2004). Additionally, commercial garnet mining is ongoing.

The direct and indirect impacts of these activities might include uprooting and trampling and canopy/ vegetation removal and soil disturbance, respectively, and would likely be detrimental to sensitive plants. Changes to habitat conditions resulting from canopy and vegetation removal would not be confined to the land on which it occurs, but would also extend to adjacent areas of intact NFS forest. Specifically, compared to interior forest, forest edges are characterized by increased solar radiation and wind, which cause increased air and soil temperatures and decreased humidity and soil moisture (e.g. Chen et. al 1995). As such, canopy removal on one area of land (e.g., private) will create a forest 'edge,' changing microclimate conditions along that 'edge.' The significance (intensity of changes in temperature, wind, and moisture) and depth (distance from edge into interior forest) may vary, depending on multiple factors, e.g., aspect (Chen et al. 1995). In addition to the changed microclimatic conditions, edge effect has also been seen to alter animal-plant interactions in ways that can negatively affect plant populations' persistence on the landscape (e.g. changes in pollination dynamics and increased seed predation by rodents) (Jules and Rathcke 1999).

Although it is not possible to ascertain the exact nature and degree of effects of activities on private land to NFS sensitive plant populations, low-to-moderate adverse past, ongoing, and future impacts are likely.

No Action alternative – Determination of cumulative effects

As discussed, the No Action alternative would have no direct impacts to sensitive plants or their habitat. However, if a catastrophic wildfire results from continued fuel loading, it would reduce habitat for all sensitive species to a certain extent (not quantifiable). Additionally, for sensitive species requiring periodic habitat disturbance, continued forest succession might have negative effects over time—although natural disturbances like storms and smaller/ low-intensity wildfires, etc. could provide necessary disturbance; on the other hand, species associated with mature/ old growth forest would benefit from the No Action alternative.

Proposed Action – Determination of cumulative effects

Because no suitable habitats are present in the project area, the Proposed Action would have **no effect** to the two threatened species listed for the Idaho Panhandle National Forests: water howellia or Spalding's catchfly.

Region 1 sensitive plants that occur only in cold forest, deciduous/ riparian, peatland/ meadows, subalpine, and aquatic habitats would not be affected by the Proposed Action because these habitats are not present in areas affected by the proposed activities. Sensitive species that occur in dry forest habitat could be affected, but at such a small relative scale to their potential population extent and other available habitat as to have no measurable effect. Therefore, it is my determination that the Proposed Action would have **no impact** to the sensitive IPNF species associated with these habitat guilds.

Of the total 7,442 acres of modeled sensitive plant habitat in the project area, 1,223 acres (c. 16%) of mostly moist and some wet forest would be affected by the Proposed Action; eighty-four percent would remain under existing conditions. Table 9, below, outlines the three main activities and their relative impacts to these 1,223, described in terms of their relative intensity and scale. Table 10 summarizes how low and moderate effects affect sensitive plant individuals, populations, and habitat.

Table 9. Relative impacts of proposed activities (intensity & scale)

Activity	Description	Scale	Magnitude of potential effects	Explanation
Regeneration harvest with ground-based yarding	High percentage of canopy removal (especially with clearcutting [versus shelterwood]) & substantial soil disturbance/ compaction	28% of regeneration harvest; 696 acres	Moderate	High degree of canopy removal & high intensity ground disturbance; relatively large scale (number of acres)
Regeneration harvest with skyline yarding	High percentage of canopy removal (especially with clearcutting [versus shelterwood]), but much less soil disturbance/ compaction than with ground-based yarding.	72% of regeneration harvest; 1782 acres	Low-moderate	High degree of canopy removal & lower intensity ground disturbance; large scale (number of acres)
New and temporary road construction	High degree of canopy removal & soil disturbance/ soil compaction, but at a limited scale	8 miles	Low	High degree of canopy removal & lower intensity ground disturbance; small scale (number of miles)

Table 10. Description of low & moderate effects to sensitive plants

Low	Individuals, populations, and/ or habitat not likely affected.
Moderate	Individuals and/ or habitat may be affected, but populations would not be affected. Over the long term, habitat capability would not be reduced to below a level that could not support sensitive plant species.

Taken together with the low adverse impacts of past, ongoing, and future federal activities cleared through the NEPA process on NFS lands, as well as the likely (but unknown) low-to-moderate adverse impacts taking place on adjacent private lands within the project boundaries, the overall cumulative impacts of the Proposed Action are thought to be adverse and low-to-moderate in the short term.

In the long term, provided that non-native, invasive species do not persist in the proposed activity areas, species whose habitat developed based on shorter cycles of disturbance may benefit in treated areas, as the Proposed Action moves the project area toward the desired condition (FW-DC-VEG-11) with respect to forest composition, structure, and patterning for the warm/moist biophysical setting.

In summary, it is my determination that overall, the Proposed Action would have low-to-moderate short-term impacts and potential beneficial long-term impacts for select sensitive plant species and habitat associated with the moist and wet forest guilds. While the Proposed Action may impact some individual plants and habitat in the short-term, it will not likely lead to a trend towards federal listing or cause a loss of viability to the population of the 22 moist and wet forest sensitive species analyzed in this report (Appendix 4).

Summary of environmental effects

Table provides a summary comparison of the environmental effects of the No Action and Proposed Action alternatives to sensitive plants and their habitat.

Table 11. Summary comparison of environmental effects to sensitive plants

Resource Indicator	Measure	No Action	Proposed Action
Sensitive plant occurrences	Number of occurrences affected	0	0 (no sensitive plant occurrences within proposed units/ areas of roadwork
Sensitive plant habitat	Total acres impacted	0 acres directly impacted; possible indirect impacts to 1,223 acres as result of continued fire suppression and forest succession & increased risk of wildfire	Low-to-moderate adverse short-term impacts to 1,223 acres due to proposed activities; potential long-term benefits to 1,223 acres (16.0% of total sensitive plant habitat in project area)
Sensitive plants response to proposed activities	Determination category	No direct impacts; indirect impacts associated with loss of suitable habitat for 22 sensitive species associated with moist & wet forest habitat due to continued fire suppression, forest succession, & the increased risk of wildfire	For 22 sensitive species associated with moist and wet forest habitat: **May impact individuals or habitat** but will not likely contribute to a trend towards Federal listing or cause loss of viability to the population or species For 10 sensitive species not associated with the above habitat types: **No impact**

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Appendices

Appendix 1: 2011 R1 sensitive species list (IPNF, St. Joe RD)

	Status and Species	Common Name	Habitat Guild
		Threatened	
1	*Howellia aquatilis*	Water howellia	Aquatic
2	*Silene spaldingii*	Spalding's catchfly	Dry grasslands, grasslands within dry forest
		Sensitive	
3	*Asplenium trichomanes*	Maidenhair spleenwort	Rock seeps in Moist/Wet Forest
4	*Blechnum spicant*	Deerfern	Moist/Wet Forest
5	*Botrychium ascendens*	Upswept moonwort	Wet Forest
6	*Botrychium crenulatum*	Dainty moonwort	Wet Forest
7	*Botrychium lanceolatum*	Triangle moonwort	Wet Forest/Moist Forest
8	*Botrychium lineare* (H)	Slender moonwort	Moist Forest
9	*Botrychium minganense*	Mingan moonwort	Wet Forest/Moist Forest
10	*Botrychium montanum*	Western goblin	Wet Forest
11	*Botrychium paradoxum*	Paradox moonwort	Wet Forest/Moist Forest
12	*Botrychium pedunculosum*	Stalked moonwort	Wet Forest
13	*Botrychium pinnatum*	Northwestern moonwort	Wet Forest/Moist Forest
14	*Botrychium simplex*	Least moonwort	Wet Forest/Moist Forest
15	*Buxbaumia aphylla* (S)	Leafless bug-on-a-stick moss	Subalpine
16	*Buxbaumia viridis*	Green bug-on-a-stick moss	Wet Forest/Moist Forest
17	*Cardamine constancei*	Constance's bittercress	Deciduous Riparian/Moist/Wet Forest
18	*Carex chordorrhiza*	String-root sedge	Peatland (Coeur d'Alene only)
19	*Carex livida*	Pale sedge	Peatland (Coeur d'Alene only)
20	*Cypripedium fasciculatum*	Clustered lady's slipper	Moist/Wet/Dry Forest
21	*Cypripedium parviflorum var. pubescens*	Greater yellow lady's slipper	Wet Forest/Wet meadows/ peatlands
22	*Grindelia howellii*	Howell's gumweed	Dry Forest (St. Joe , basalt breaklands)
23	*Grimmia brittoniae*	Britton's Grimmia moss	Rock outcrops in Moist Forest
24	*Hookeria lucens* (H)	Clear moss	Wet Forest

	Status and Species	Common Name	Habitat Guild
25	*Hypericum majus*	Large Canadian St. Johnswort	Peatland (Coeur d'Alene)
26	*Mimulus alsinoides*	Chickweed monkeyflower	Rock cliffs/ seeps in Wet/Moist/Dry Forest
27	*Pinus albicaulis*	Whitebark pine	Alpine/ subalpine
28	*Rhynchospora alba*	White beakrush	Peatlands (Coeur d'Alene)
29	*Rhizomnium nudum*	Naked Mnium moss	Wet/Moist Forest
30	*Scheuchzeria palustris*	Pod grass	Peatlands (Coeur d'Alene)
31	*Schoenoplectus subterminalis*	Water clubrush	Peatlands (Coeur d'Alene)
32	*Thelypteris nevadensis* (S)	Sierra woodfern	Wet Forest seeps
33	*Triantha occidentalis* spp. *brevistyla*	Sticky asphodel	Subalpine Peatlands (St. Joe ?)
34	*Waldsteinia idahoensis*	Idaho barren strawberry	Moist and Wet Forest

* based on Regional Forester's TES list, (S) = suspected to occur on the IPNF, (H) = historical occurrence on the IPNF

Coeur d'Alene River and St. Joe Ranger District Forest Species of Concern, May 2011*

Species	Common Name	Habitat Guild
Astragalus bourgovii	Bourgeau's milkvetch	Subalpine
Botrychium michiganense (s)	Michigan moonwort	Moist Forest
Calochortus nitidus (s)	Broadfruit mariposa lily	Dry Forest, Palouse Soils (St. Joe, St. Maries)
Carex californica	California sedge	Subalpine
Carex hendersonii	Henderson's sedge	Moist/Wet Forest
Cetraria sepincola	eyed ruffle lichen	Deciduous Riparian, Peatland
Cladonia bellidiflora (s)	Toy soldiers	Moist Forest
Cladonia transcendens (s)	transcending reindeer lichen	Wet Forest
Collema curtisporum	Short-spored jelly lichen	Deciduous riparian
Corydalis caseana spp. hastata (s)	Case's fitweed	Wet Forest (St. Maries, North Fk Clearwater)
Dodecatheon dentatum	White-flowered shooting	Wet Forest
Cephalanthera austiniae	Phantom orchid	Moist/Wet Forest
Lobaria hallii	Hall's lungwort	Deciduous Riparian
Lobaria scrobiculata (s)	Textured lungwort	Deciduous Riparian
Ludwigia polycarpa	Manyfruit primrose willow (false-loosestrife)	Peatland/aquatic

Mimulus clivicola	Bank monkeyflower	Dry Forests
Romanzoffia sitchensis	Sitka mistmaiden	Subalpine
Orobanche pinorum	Pine broomrape	Dry Forest
Platanthera orbiculata	Round-leaved orchid	Moist/Wet Forest
Pilophorus acicularis (on pvt	Devil's matchstick lichen	Wet Forests
Ribes sanguineum (s)	Red-flowered currant	Moist forest
Sedum rupicolum(s)	Lance-leaved sedum	Subalpine
Sphaerophorus globosus	Christmas tree lichen	Wet Forest
Tauschia tenuissima (s)	Lieberg's tauschia	Dry/Moist Forest, meadows
Thamnolia subuliformis	Worm lichen	Subalpine
Trientalis latifolia	Western starflower	Deciduous Riparian/Moist/Wet Forest
Vallisneria americana	Wild celery	Aquatic

(s) = suspected to occur on the Coeur d'Alene River Ranger District

* As directed by the Species of Concern Protocol (Region One Planning Peer Group, Task Group 19, March 1997), species of concern are considered to be secure at the global, Regional and state levels, but may be at risk at the Forest planning level. Species on this list will be surveyed for, documented and reported when found, and addressed in environmental documents (per NFMA) when viability within the planning unit is an issue.

Appendix 2: Mousseaux's (1998) St. Joe and Coeur d'Alene Rare Plant Guild Descriptions: Based on October 2004 Regional Forester's Species at Risk list[5]

Subalpine Plant Guild: Includes certain plant communities found at high elevation sites, generally above ca 5,000 feet, mostly on ridges, subalpine balds and parklands (subalpine grass and sedge communities), exposed rock-outcrops and the following high elevation communities: *Abies bifolia* (subalpine fir) krummholtz, *Abies bifolia / Rhododendron albiflorum* (subalpine fir/white rhododendron), *Salix commutata* (undergreen willow), *Abies bifolia / Vaccinium scoparium* (subalpine fir/grouse whortleberry), *Abies bifolia / Luzula hitchcockii* (subalpine fir/smooth woodrush), and *Larix lyallii* (subalpine larch) / *Pinus albicaulis* (whitebark pine) plant communities. It also includes the cool/moist and cool/dry phases of *Abies bifolia* / *Menziesia ferruginea* (subalpine fir / menziesia), *Abies bifolia / Xerophyllum tenax* (subalpine fir / beargrass), *Tsuga mertensiana / Menziesia ferruginea* (mt. hemlock / menziesia) and *Tsuga mertensiana / Xerophyllum tenax* (Mt. hemlock / beargrass) plant communities. The rare species found in this guild include *Buxbaumia aphylla* (bug-on-a-stick moss), and *Cetraria subalpina* (Iceland-moss lichen), a Forest Species of Concern (FSOC), that is associated with menziesia in cold subalpine fir sites. *Pinus albicaulis* (Whitebark pine) occupies exposed ridges on harsh sites, generally above 5,000 feet.

Wet Forest Guild: This guild is found in wet, generally riparian, often (not always) middle to late successional western redcedar and wet western hemlock plant communities, including most identified 'ancient cedar groves' found scattered throughout the northern sub-basins, generally less than 4,000 feet. Certain plant communities within these systems have a high potential to support rare plants, including *Thuja plicata / Oplopanax horridum* (cedar/devil's club), *Thuja plicata* / *Athyrium filix-femina* (cedar/ladyfern), *Thuja plicata* / *Adiantum aleuticum* (cedar/maidenhair fern), *Tsuga heterophylla* /

[5] There have been changes in status for some species discussed here—e.g., *Spiranthes diluvialis* (Deciduous Riparian guild) is no longer a federally listed, threatened species in Idaho). See Appendix 2 for the current list of TES species.

Gymnocarpium dryopteris (western hemlock/oakfern) and *Thuja plicata* / *Gymnocarpium dryopteris* (cedar/oakfern) plant communities. Several species within this guild are rare coastal disjuncts such as *Blechnum spicant* (deerfern), *Thelypteris nevadensis (*sierra woodfern*), Hookeria lucens* (clear moss) and *Carex hendersonii (*Henderson's sedge). Sierra woodfern and clear moss are associated with seeps and "boggy" areas in wet cedar forests. Certain endemic or scattered rare species like the rare *Botrychium* spp. (moonworts), especially *Botrychium montanum* (western goblin), *Botrychium minganense* (Mingan moonwort), *Botrychium pedunculosum* (stalked moonwort), *Botrychium paradoxum* (paradox moonwort), and *Botrychium ascendens* (upswept moonwort), can be found in these communities on riparian benches or other shallow sloped microsites. The scattered species *Cypripedium fasciculatum* (clustered lady's slipper), Cypripedium parviflorum var. pubescens (greater yellow lady's slipper), and the Idaho endemics *Cardamine constancei* (Constance's bittercress) and *Waldsteinia idahoensis* (Idaho Barren strawberry) can occur in wet forest communities. *Asplenium trichomanes* (maidenhair spleenwort) and *Mimulus alsinoides* (chickweed monkey-flower) can also be found in seasonally wet rock seeps, and *Buxbaumia viridis* (green bug-on-a-stick moss), a Forest Species of Concern (FSOC), can be found on decomposing cedar logs in wet forest habitat. Many of the Wet Forest Guild species can also be found in upslope, Moist forest guild habitats.

Moist Forest Guild: This guild is found in moist *Thuja plicata* (western redcedar) and *Tsuga heterophylla* (western hemlock) plant communities, generally in later successional states below 4,500 feet. A few species can also be found in moist *Abies grandis / Asarum caudatum* (grand fir / ginger) and *Abies grandis / Clintonia uniflora* (Grand fir / queencup beadlily) communities. Many members of the Wet Forest Guild can be found in these more mesic upland plant communities. This guild contains the following plant associations: *Tsuga heterophylla* / *Asarum caudatum* (hemlock/wild ginger), *T. heterophylla / A. caudatum - Aralia nudicaulis* (hemlock/ginger - wild sarsaparilla), *T. heterophylla / Clintonia uniflora* (hemlock / beadlily), *T. heterophylla / C. uniflora / Aralia nudicaulis* (hemlock / beadlily - wild sarsaparilla), *T. heterophylla / C. uniflora / Menziesia ferruginea* (hemlock / beadlily - fool's huckleberry), *Thuja plicata / Asarum caudatum* (cedar/ginger) and *Thuja plicata / Clintonia uniflora* (cedar/beadlily). Some of the rare species found in these communities occur in small moist microsites, like *Asplenium trichomanes* (maidenhair spleenwort) and *Mimulus alsinoides* (chickweed monkey-flower), which are found on seepy rock outcrops. Rare plant species such as the coastal disjuncts *Blechnum spicant* (deerfern) and *Carex hendersonii (*Henderson's sedge) are found in moist forest habitats. Certain regional endemic or scattered rare species like the *Botrychium* spp. (moonworts), especially *Botrychium minganense* (Mingan moonwort), *Botrychium lanceolatum* (Triangle moonwort) and *Botrychium pinnatum* (northwestern moonwort) can be found in shallow sloped microsites, and *Cypripedium fasciculatum* (clustered lady's slipper) and the Idaho endemic *Cardamine constancei* (Constance's bittercress) occur in these communities. *Waldsteinia idahoensis* (Idaho barren strawberry), an Idaho endemic, has also been found in *Abies grandis / Clintonia uniflora* (grand fir / beadlily) communities on the breaklands of the Coeur d'Alene River.

Dry Forest Guild: This guild encompasses dry, open sites in *Pinus ponderosa* (ponderosa pine), *Pseudotsuga menziesii / Physocarpus malvaceus* (Douglas-fir / ninebark), *P. menziesii / Calamagrostis rubescens* / *Arctostaphylos uva-ursi* (Douglas-fir / pinegrass - kinnikinnick), *P. menziesii / Festuca idahoensis* (Douglas-fir / Idaho fescue) or *Agropyron spicatum* [*Elymus spicatus*] (bluebunch wheatgrass) communities, generally less than 4500 feet. The Idaho endemic, *Grindelia howellii* (Howell's gumweed) can be found in these dry communities on the St. Joe associated with basalt breaklands. Dry Douglas-fir and grand fir communities, *P. menziesia* / *Physocarpus malvaceus* (Douglas-fir / ninebark) ,and *Abies grandis / Physocarpus malvaceus* (grand fir / nine bark) also support populations of *Cypripedium fasciculatum* (clustered lady's slipper) on the Coeur d'Alene and St. Joe National Forests. *Orobanche pinorum* (pine broomrape) is found in association with *Holodiscus discolor* (oceanspray) in dry forests of Douglas fir and grand fir. *Mimulus alsinoides* (chickweed monkey-flower) can occur on seasonally seepy rock outcrops and moss mats in otherwise dry communities.

Deciduous Riparian Guild (broad-leaved deciduous) forests occur on islands and margins of lowland major rivers such as the lower Coeur d'Alene River, lower St. Joe River, and the St. Maries River. These forests are most commonly dominated by the cottonwood *Populus trichocarpa* (black cottonwood), with lesser amounts of introduced *P. deltoides* (plains cottonwood) and hybrid poplars (*Populus trichocarpa* X ?) planted for streambank stability. Cottonwood communities often are adjacent to shrub-carr communities and can form an indistinguishable mosaic. These communities provide the only high potential habitat for the listed threatened species *Spiranthes diluvialis* (Ute ladies'-tresses), which is suspected to occur here. *Collema curtisporum* (short-spored jelly lichen), is a globally rare lichen found on large diameter (old) black cottonwood. The rare Idaho endemic *Cardamine constancei* (Constance's bittercress) can be found in the transition zone between cottonwood and western redcedar communities on the Coeur d'Alene and St. Joe Rivers. Stands of *P. tremuloides* (quaking aspen) are also present and associated with higher gradient streams or moist seeps. *Populus tremuloides* (quaking aspen), *Betula papyrifera* (paper birch) and *Betula occidentalis* (water birch) also occur as secondary components in lowland conifer dominated forests throughout northern Idaho. *Alnus rubra* (red alder), is an uncommon, but sometimes locally abundant, coastal disjunct, and can be a codominant in moist forests in lower elevation riparian zones along Coeur d'Alene Lake, the lower St. Joe and the lower St. Joe River. It is also found in patches in drainages in the Little North Fork of the Clearwater River on the Idaho Panhandle National Forests. Channel bars along major rivers are frequently vegetated with *Salix exigua* (coyote willow) and young *Populus trichocarpa* (black cottonwood) seedlings.

Aquatic Guild: This guild occurs generally in littoral (< 2 meters) zones of vernal pools, small ponds and lakes throughout northern Idaho, generally at lower elevations. *Potamogeton natans* (floating-leaved pondweed), *Myriophyllum* spp. (water-milfoil), *Utricularia* spp. (bladderwort), and other *Potamogeton* spp. occur alone or in combination in shallow littoral zones. *Nuphar polysepalum* (yellow pond lily) and *Brasenia shreberi* (water-shield) are frequently present as monocultures in deeper littoral zones. A single population of the rare *Nymphaea tetragona var. liebergii* (pygmy waterlily) was historically known from Granite Lake and is believed to be extinct in Idaho. The listed threatened species *Howellia aquatilis* (water howellia) was historically known to occur near Spirit and Hoodoo Lakes and is believed to have been extirpated. Only one other population is known in Idaho near Harvard along the Palouse River; however, populations occur to the west in Spokane County, Washington. No other populations have been found to date in northern Idaho, even though high quality habitat exists.

Peatland Rare Plant Guild: Peatlands by definition are habitats whose soil substrate is composed of organic material; deposition of organic material exceeds decomposition. This guild can be divided into five distinct sub-guilds, each containing different communities and species, substrates, pH and abiotic processes. These five sub-guilds are Poor Fens, Intermediate/Rich Fens, Ombrotrophic Bogs, Paludified Forests and Shrub-carr (see descriptions below). Peatland habitats are predominantly found in the northern three sub-basins (Priest, Kootenai and Pend Oreille); however, several lowland fens are known for the lower Coeur d'Alene (Twin Lakes, Hauser Lakes, Rose Lake, Hidden and Thompson lakes). Several *Sphagnum*-dominated subalpine peatlands have been found on the divide between the Clearwater and the St. Joe sub-basins. Some small low elevation peatlands are known south of Clarkia. Peatlands are the oldest plant communities in northern Idaho and have changed little since the end of glaciation 6,000-7,000 years ago (Bursik and Moseley 1995; Moseley 1998). The rare species *Carex chordorrhiza* (string-root sedge), *Carex livida* (pale sedge), *Hypericum majus* (large Canadian St. John's wort), *Rhynchospora alba* (white beakrush), *Scheuchzeria palustris* (pod grass) and *Scirpus subterminalis* (water clubrush) have been documented for lowland fens in the Coeur d'Alene sub-basin. *Triantha occidentalis spp. brevistyla*, a species only known on the Priest Lake District on the Idaho Panhandle, has been reported for a subalpine fen complex on the St. Joe ; however, this sighting has not been verified. No survyes have occurred in the low elevation peatlands on the St. Joe.

Poor fens: Poor fens occur in glacial scours, kettle holes, isolated oxbows, old lake beds and at or near the heads of drainages where inflow is limited. Thick layers of *Sphagnum* peat have accumulated since the end of continental glaciation, about 6,000 - 7,000 years ago. These systems are minerotrophic,

receiving nutrients from water percolating through mineral soil or bedrock, and are quite acidic (pH values 4-6). These communities are characterized by a solid mat of *Sphagnum* moss and scattered stems of vascular plants. These communities are often erroneously referred to as 'bogs', especially when they occur on floating mats in seepage lakes.

Ombrotrophic bogs: These 'true bog' communities occur in glacial scours, kettle holes, isolated oxbows, old lake beds and at or near the heads of drainages where inflow is limited. Unlike poor fens, the thick mats of peat accumulate upwards forming hummocks, often at the base of shrubs or downed logs, and are above the influence of the water table. Incoming water and nutrients (from precipitation) are held above the water table, primarily by the low hydraulic conductivity of the *Sphagnum* peat. Vascular species are few or absent and are restricted to those tolerant of acidic conditions (poor fen species). The pH values are very acidic, ranging from pH 3- pH 4. Compared to rich fens (pH 6 - 7.5) the pH difference is equal to the difference between vinegar and salt water.

Intermediate and Rich Fens: Intermediate fens and rich fens are *Sphagnum*-poor peatlands with vascular plants contributing the majority of cover and composition. Laymen usually refer to these communities as marshes, wet meadows or swamps. The difference is that fen soils are organic, usually with little to no decomposition of organic material. True marshes have mineral soils, usually with high rates of decomposition. Intermediate fens have equal dominance by bryophytes (*Sphagnum* spp. and true mosses) and vascular plant species, especially sedges, while rich fens have few (if any) *Sphagnum* species present. Organic soils of rich fens are formed by accumulation of sedge, grass and brown moss peat (*AulacoMnium* and *Calliergon* species). *Carex utriculata* (beaked sedge), *Carex lasiocarpa* (slender sedge), *Carex aquatilis* (water sedge), *Scirpus microcarpus* (small- fruited bulrush), *Typha latifolia* (cattails), *Calamagrostis canadensis* (bluejoint reedgrass), *Spiraea douglasii* (hardhack), *Betula glandulosa*, (bog birch) and *Salix* spp. (willow)-dominated community types may occur as rich fens. Intermediate to rich fens in subalpine habitat are characterized by *Carex scopulorum* (Holm's mountain sedge), *Carex aquatilis* (water sedge), *Calamagrostis canadensis* (bluejoint reedgrass), *Deschampsia cespitosa* (tufted hairgrass) and other species like *Kalmia microphylla* (bog laurel) and *Dodecatheon jeffreyi* (tall mountain shooting star). Rich fens are the most floristically diverse of the peatland types. Like poor fens, intermediate and rich fen communities can also occur on floating or fixed organic mats. Floating mats contain some of the most ecologically stable communities occurring in north Idaho peatlands because they adjust to fluctuating water levels annually, maintaining constant contact with water and never becoming inundated like fixed (shore) mats. The pH values for intermediate and rich fens can range between pH 6 - 7.5.

Paludified Forests: Paludified forests typically occur on the margins of closed peatland basins and often form a mosaic with poor fen, rich fen or shrub-carr communities. These communities are the result of expanding peatlands caused by a rise in the water table from peat accumulation. Paludification is thought to precede the formation of poor fen and true bog (ombrotrophic) habitats (Crum 1992). Paludified forests are characterized by an overstory of conifers, usually *Pinus contorta* (lodgepole pine) and *P. monticola* (white pine), with lesser amounts of *Abies bifolia* (subalpine fir), *A. grandis* (grand fir), *Picea engelmannii* (Engelmann spruce), *Thuja plicata* (western redcedar) or *Tsuga heterophylla* (western hemlock), with a soil that is *Sphagnum* peat. The understory is dominated by *Sphagnum* moss species and some vascular plants, including some rare species found in poor fens and ombrotrophic bogs. One species, *Maianthemum dilatatum* (false lily-of-the-valley) has been found in a single location in northern Idaho in a paludified forest.

Shrub-Carr: This sub-guild includes moist shrub land riparian communities. Shrub lands dominated by willows and other shrubs occur in nearly impenetrable patches along low gradient channels, as stringers or on narrow flood plains along high gradient streams, as mosaic patches within riparian forests, and on margins of meadows and fens communities. Most commonly, one or more shrubs dominate vast areas of moist to wet, seasonally flooded fens or riparian zones. Shrub-carrs often contain willow dominated shrub lands associated with low gradient meandering channels, or fens, and are dominated by *Salix*

drummondiana (Drummond's willow), with lesser amounts or codominance by *Salix geyeriana* (Geyer's willow) and *S. sitchensis* (Sitka willow), and can contain *S. bebbiana* var. *bebbiana* (Bebb's willow), *Spiraea douglasii* (hardhack), *Alnus incana* (mountain alder), or *Betula glandulosa* (bog birch) community types. The rare willows *Salix candida* (hoary willow) and *Salix pedicellaris* (bog willow) can be found in shrub-carrs and in shrub/fen mosaics. *Betula pumila* (dwarf birch), a rare species in northern Idaho, can be found in shrub-carrs in the Moyie and Kootenai river systems. One rare lichen, *Cetraria sepincola* (bog-birch lichen), is found exclusively on the branches of bog and dwarf birches. Rare hybrids between *Betula pumila* (dwarf birch) and *Betula glandulosa* (bog birch) - known as *Betula X sargentii* - occur from the Priest River drainage (Johnson 1995). Willows are frequently absent or a minor component of shrub lands associated with higher gradient streams. *Alnus incana* (mountain alder), *Alnus sinuata* (Sitka alder), *Cornus sericea* (red-osier dogwood) and *Rhamnus alnifolia* (alder buckthorn) occur as community dominants along higher gradient streams. Patches of *Cornus sericea* (red-osier dogwood), *Salix bebbiana* var. *bebbiana* (Bebb's willow), *Crataegus douglasii* (Douglas hawthorn) and *Crataegus suksdorfii* (Suksdorf's hawthorn) are common in association with cottonwood forests on larger stream systems. *Crataegus columbiana* (Columbia hawthorn) is only found in warm,

Appendix 3: Non-native, invasive terrestrial plant species targeted for control measures on the IPNF

Scientific Name	Common Name
Potential invaders (currently absent)[1]	
Achillea nobilis	Noble yarrow
Alliaria petiolata	Garlic mustard
Anchusa arvensis	Small bugloss
Bassia scoparia	Burning bush
Butomus umbellatus	Flowering rush
Campanula rapunculoides	Creeping bellflower
Convolvulus arvensis	Field bindweed
Euphorbia myrsipnites	Myrtle spurge
Nardus stricta	Matgrass
Polygonum sachalinense	Giant knotweed
Salvia aethiopis	Mediterranean sage
Solanum rostratum	Buffalobur
Sorghum halepense	Johnsongrass
Tamarix sp.	Saltcedar complex
Tribulus terrestris	puncturevine
New invaders	
Acroptilon repens	Russian knapweed
Anchusa officinalis	Common bugloss
Arctium minus	Common burdock
Barbarea vulgaris	Garden yellowrocket
Berteroa incana	Hoary alyssum
Caragana arborescens	Siberian pea shrub
Cardaria draba	Hoary cress, Whitetop
Cardus nutans	Musk thistle
Centaurea diffusa	Diffuse knapweed
Centaurea solstitalis	Yellow starthistle
Chaenorhinum minus	Dwarf snapdragon
Chondrilla juncea	Rush skeletonweed
Crupina vulgaris	Common crupina
Cytisus scoparius	Scotch broom
Digitalis purpurea L.	Foxglove
Echium vulgare	Blueweed, Texas blueweed
Elaeagnus angustifolia	Russian olive
Euphorbia esula	Leafy spurge
Fallopia x. bohemica, F. japonica (prev. Polygonum cuspidatum, P. japonica)	Bohemian or Japanese Knotweed

Scientific Name	Common Name
Hypochaeris radicata	Spotted cat's ear
Iris pseudacorus	Yellow-flag iris
Isatis tinctoria	Dyer's woad
Jacobaea vulgaris (prev. Senecio jacobaea)	Tansy ragwort
Knautia arvensis	Field scabious
Kochia scoparia	Kochia
Lepidium draba (prev. Cardaria draba)	Hoary cress, Whitetop
Lepidium latifolium	Perennial pepperweed
Lythrum salicaria	Purple loosestrife
Myriophyllum spicatum	Eurasian watermilfoil
Onopordum acanthium	Scotch thistle
Potentilla argentea	Silvery cinquefoil
Ranunculus acris	Tall buttercup
Solanum dulcamara	Climbing nightshade
Solanum elaeagnifolium	Silverleaf nightshade
Trifolium arvense	Hare's foot clover
Tripleurospermum maritime	Scentless chamomile
Widespread Weeds[3]	
Artemisia absinthium	Absinth wormwood
Bromus tectorum	Cheatgrass
Centaurea debeauxii (prev. C. nigrescens)	Meadow knapweed
Centaurea stoebe	Spotted knapweed
Cichorium intybus	Chicory
Cirsium arvense	Canada thistle
Cirsium vulgare	Bull thistle
Conium maculatum	Poison hemlock
Cynoglossum officinale	Houndstongue
Hieracium aurantiacum	Orange hawkweed
Hieracium caespitosum	Meadow/Yellow Hawkweed complex
Hypercium perforatum	St. Johnswort
Lathyrus latifolius	Perennial pea
Leucanthemum vulgare	Oxeye daisy
Linaria dalmatica	Dalmatian toadflax
Linaria vulgaris	Yellow toadflax
Matricaria discoidea	Pineapple weed
Melilotus officinalis	White and Yellow sweet clover
Phalaris arundinacea	Reed canary grass
Potentilla recta	Sulfur cinquefoil
Sisymbrium altissimum	Tumble mustard

Scientific Name	Common Name
Sonchus arvensis	Perennial sowthistle
Tanacetum vulgare	Common tansy
Verbascum thapsus	Mullein
Veronica chamaedrys	Germander speedwell
Veronica officinalis	Common speedwell

1. Potential invaders: Goal is to prevent and eradicate promptly if found
2. New invaders: Goal is to eradicate small new infestations and reduce larger infestations
3. Widespread weeds: Goal is to contain inside infested area and reduce plant populations

Appendix 4: Description of moist, dry, and wet forest habitat associates

	Species Name	Geographic distribution	G/T-rank/ S-rank*	Associated IPNF habitat guild	Notes regarding habitat requirements, population ecology, threats	Can disturbance be beneficial?
1	*Asplenium trichomanes* (Maidenhair spleenwort)	Interruptedly circumboreal	G5/ S1	Microhabitat: rock seeps in moist/ wet forests	Maidenhair spleenwort occurs in moist, rocky, cliff crevices and talus slopes; prefers calcareous rock (Lorain 1989). Threats: "Timber harvest and other habitat-altering activities such as road building and rock quarries pose the most significant threat to maidenhair spleenwort" (Lorain 1989).	No – see notes regarding habitat alteration
2	*Blechnum spicant* (Deer fern)	Circumpolar, coastal disjunct	G5/ S3	Moist/ wet forest	Associated with both early successional and old growth/ climax moist and wet forests (western hemlock, Sitka spruce, western redcedar, Douglas-fir, and Pacific silver fir forests). Appears after disturbances such as windfall, logging. Cover/ distribution changes with changes in stand composition and age (e.g., cover increases in climax stages) (Mathews 1993).	Yes – associated with various successional stages
3	*Botrychium ascendens* (upswept moonwort)	Circumboreal	G3/S1	Wet forest	"With the exception of *B. montanum*… moonworts tend to occur in areas of disturbance that are from 10 to 30 years old. This includes old roads and roadsides, picnic and camping grounds, pastured meadows, avalanche meadows, etc. We seldom find moonworts in abundance under mature old growth forests without recent disturbance." (Ahlenslager and Potash 2007: 34). Moonworts "tend to occur in areas where some mineral soil is exposed or has been exposed within the last 10-30 years. This probably has to do with the ability of arriving spores to percolate into the soil and perhaps also with the establishment and ecology of the appropriate mycorrhizal fungi." (Ahlenslager and Potash 2007: 34). "The recently or periodically disturbed sites that support moonworts have several characteristics in common. They support vegetation that is in an early stage of succession. … They have a generous surface exposure of mineral soil (20% or more). They often have a compacted soil." (Ahlenslager and Potash 2007: 34)	Yes – 10-30 year disturbance cycle and evidence of persistence/ presence in compacted soils.
4	*B. crenulatum* (dainty moonwort)	Circumboreal	G4/S1	Wet forest		
5	*B. lanceolatum* var. *lanceolatum* (Lanceleaf moonwort)	Circumboreal	G5T4/ S3	Moist/ wet forest		
6	*B. lineare* (Slender moonwort)	Circumboreal	G1/ SH	Moist forest		
7	*B. minganense* (Mingan moonwort)	Circumboreal	G4/ S3	Moist/ wet forest		
8	*B. montanum*	Circumboreal	G3/S2	Wet forest		
9	*B. paradoxocum* (Paradox moonwort)	Circumboreal	G2/ S1	Moist/ wet forest		
10	*B. pedunculosum*	Circumboreal	G3/S1	Wet forest		
11	*B. pinnatum* (Northern moonwort)	Circumboreal	G5/ S2	Moist/ wet forest		
12	*B. simplex* (Least moonwort)	Circumboreal	G5/ S2	Moist/ wet forest		
13	*Buxbaumia viridis* (Green bug-on-a-stick)	Interruptedly circumboreal	G4/ S2	Moist/ wet forest	Rotten stumps/ logs; mineral or organic soil. Cool, shaded humid locations at middle elevations. Closed canopy provides necessary microclimate for species occurring on decaying wood and humic duff. "Shelterwood and thinning prescriptions for timber harvest may impact populations, as logs dry out under the changing microclimate regime" (USDI 1996: 5). BUVI requires "continued input of coarse woody debris in various decay classes and diameters as a substrate" (USDI 1996: 5). "Maintain decay class 3, 4, and 5 logs, leaving windfalls in place to provide structurally diverse habitat and maintain a dense overstory to maintain humidity (< 70% closed canopy)" (USDI 1996: 2).	No – see notes
14	*Cardamine constancei* (Constance's bittercress)	Endemic to northern Idaho	G3/ S3	Moist/ wet forest and deciduous riparian habitat	Micro-sites appear to be important in protecting relict populations (in 70-100 year-old stands). "From these relict populations the species may expand as forest succession proceeds." (Lichthardt and Moseley 1994). Changes to canopy cover has variable results: although increased light stimulates flowering and perhaps production of ramets, direct sun following canopy removal causes mortality to plants. Limited genetic variability at intra-population level (due to predominant clonal propagation and small, reproductively-isolated populations)	Possibly – see notes

	Species Name	Geographic distribution	G/T-rank/ S-rank*	Associated IPNF habitat guild	Notes regarding habitat requirements, population ecology, threats	Can disturbance be beneficial?
15	*Cypripedium fasciculatum* (Clustered lady's slipper)	Sparsely distributed within broad range spanning mountainous areas of eight western states	G4/ S3	Moist/ wet/ dry forest	General habitat conditions: in northern Rocky Mountains, this species is associated with coniferous forest or inclusions within coniferous forests. Some degree of shade required, although this may range from deep or partial shade to dappled sunlight. See Brown (2008) for a discussion of the potential significance of different types of shade created by conifers, drier site shrubs, and broader-leaved shrubs associated with moister-habitat conditions, such as Pacific dogwood, for Sierra Nevada occurrences of *Cypripedium fasciculatum*. Soil conditions: Lichthardt (2003: 8-9) observes that while CYFA may be a habitat generalist, as with all orchids, it requires the presence of an organically-enriched O horizon with healthy mycorrhizal networks (i.e., its roots are colonized by hyphae of symbiotic soil fungi). It is typically associated with forest floors with layers of litter and duff. Because of its reliance on mycorrhizae, CYFA is very vulnerable to, and unlikely to survive, direct soil disturbance. Habitat: in northern Idaho and western Montana, "[f]orest structure and composition have largely resulted from past fires (Lichthardt 2003: 6). Associated habitat types in northern Idaho (western Montana) include both dry and moist forest (Lichthardt 2003: 7, 9). Dry forest sites are characterized by Douglas-fir/ ninebark and grand fir/ ninebark habitat and shorter disturbance cycles: 10-30 year cycles of fire. In the case of CYFA associated with dry forest habitat, Lichthardt (2003: 9) observes that the more densely stocked forests and greater canopy cover associated with the past 50 years of fire suppression may negatively impact suitable habitat by increasing the chances of a stand-replacing fire. Moist forest habitats typified by Western redcedar (and including western hemlock and grand fir) historically experienced longer disturbance intervals: 75-100 year underburn cycles and 150->200 year cycles for stand-replacing fires. Lichthardt (2003: 17) suggests that increasing stand age and development may contribute to the development of habitat for CYFA and, citing Harrod (personal communication), further suggests that CYFA "may be thriving in some areas under conditions of fire suppression. As stands age, they become patchy and multilayered, allowing more light to the forest floor and building up deeper duff layers and rotted wood that provide a medium for a rich fungal network." Moist forest habitat CYFA occurrences in this region are either mid-seral, or, more frequently, late-seral (Lichthardt 2003: 7) Fire: The direct impacts of fire to existing individual plants will vary depending on fire intensity. Specifically, if the fire temperature is moderate and the duff layer is left somewhat intact, the underground portion of the plant may survive; more intense fires will kill existing plants.	No – occurrences typically associated with mid- or, more frequently, late-seral stands. See Lichthardt's (2003: 7) discussion of important light and soil elements of late-seral stands.
16	*Grimmia brittoniae* (Britton's grimmia moss)	Narrow endemic – western Montana and northern Idaho	G2/ S2	Microhabitat: (calcareous) rock cliffs in moist forest	Threats for one Montana population include road widening, which may affect cliff face upon which moss grows (MNHP 2017).	No – narrow microhabitat adaptation
17	*Grindelia howellii* (Howell's gumweed)	Regional endemic- Missoula and Powell Counties, MT; Benewah County, ID	G3/S1	Dry forest	Could be negatively impacted by road development or management based on existence on roadsides. Restricted endemics can be limited by dispersal distances and low genetic diversity; their limited range and habitat preference can make them more susceptible to fragmentation (Williams et al 2017).	Yes–prefers lightly disturbed soil including roadsides and pastures (MNHP 2018)
18	*Hookeria lucens* (Clear moss)	British Columbia south to Idaho in the U.S.	G5/S1	Wet forest	Confined to intermittent or perennial seeps, springs, and streams.	No – narrow microhabitat adaptation
19	*Mimulus alsinoides* (Chickweed monkeyflower)	British Columbia south to Idaho and northern California	G5/ S1	Microhabitat: rock cliffs, seeps in wet/ moist/ dry forest habitat	Vernally moist rocky cliffs (Klinkenberg 2017).	No – given microhabitat adaptation; however, more data necessary
20	*RhizoMnium nudum* (Naked Mnium moss)	Amphi-beringian distribution.	G4/ S1	Moist/ wet forest	Moist, coniferous forests. Associated with mature, stable stands (i.e., lacking disturbance); riparian areas (low gradient) (Harpel and Holmberg 2005). Narrow environmental specificity: moist, but not wet, substrates; can be along streams or by persistent snowpack	No – see notes

	Species Name	Geographic distribution	G/T-rank/ S-rank*	Associated IPNF habitat guild	Notes regarding habitat requirements, population ecology, threats	Can disturbance be beneficial?
21	*Thelypteris nevadaensis* (Sierra woodfern)	British Columbia south to Idaho, Oregon, Washington, California	G4/S1	Wet forest seeps	Occurs along streambanks, springs, and moist woods, from foothills to middle altitudes in the mountains.	Not likely–depends on intact wet/moist habitat
22	*Waldsteinia idahoensis* (Idaho barren strawberry)	Narrow endemic	G3/ S3	Moist/ wet forest	Habitat includes moist grand fir forests under closed canopy and in forest openings. Canopy opening may increase reproduction in the short-term; low-intensity fire will not affect the species (Crawford 1980).	Possibly – more data necessary

Appendix 5: Sensitive species & FSOC documented in project area outside of treatment units

#	Species Name	Geographic distribution	G/T-rank/ S-rank*	Associated IPNF habitat guild	Notes regarding habitat requirements, population ecology, threats	Can disturbance be beneficial?
1	*RhizoMnium nudum* (Naked Mnium moss)	Wide range in North America; rare throughout a large portion of this range, particularly to the south.	G4G5/ S1	Moist/ wet forest	Moist, coniferous forests. Associated with mature, stable stands (i.e., lacking disturbance); riparian areas (low gradient) (Harpel and Holmberg 2005). Narrow environmental specificity: moist, but not wet, substrates; can be along streams or by persistent snowpack.	No
2	*Blechnum spicant* (Deer fern)	Infrequent in BC (Manning P.P. east to the Okanagan Valley); south to OR, ID	G5/ S3	Moist/ wet forest	Associated with both early successional and old growth/ climax moist and wet forests (western hemlock, Sitka spruce, western redcedar, Douglas-fir, and Pacific silver fir forests). Appears after disturbances such as windfall, logging. Cover/ distribution changes with changes in stand composition and age (e.g., cover increases in climax stages) (Mathews 1993).	Yes – associated with various successional stages
3	*Hookeria lucens* (Clear moss)		G5/S1	Wet Forest	Confined to intermittent or perennial seeps, springs, and streams.	No

Appendix 6. Past, present, and reasonably foreseeable actions.

Action	Past	Present	Reasonably foreseeable	Level of cumulative effects	Comments
Timber harvest on private land	X	X	X	**NA**	It is not possible to quantify the effects of timber harvest on p plants on nearby or adjacent NFS lands. Where botanical inv not possible to know about the species or habitat present or a numbers, or status of rare plants. Additionally, it is not possib any potential impacts to rare plants and/ or their habitat on pr or would affect rare plants in the proposed project area. As a private lands is not considered to have a cumulative effect on within the proposed project area.
Timber harvest on NFS lands	X		X	**Low to moderate**	Timber harvest affects canopy coverage and causes soil distu potential impacts can vary depending on the silvicultural pres used. Silvicultural practices such as thinning or harvest mech helicopter yarding, or operations on snow or frozen soils wou cumulative effects on rare plants—as direct impacts may be l intense (e.g., trampling plants, rutting soil, soil compaction), b habitat still occur (canopy cover decreases). Silvicultural acti regeneration harvest or harvest mechanisms such as ground in **moderate** cumulative effects to rare plants (see the Emera details). When a combination of silvicultural prescriptions and used, such activities may be considered to result in a range o **cumulative effects** to rare plants. In the case of **low** impacts and habitat are likely not affected; in the case of **moderate** in individuals and/ or habitat may be affected, no entire populati would the long-term capability of the habitat to support rare p
FS prescribed burning for site preparation & fuels treatment				**Low to moderate**	Prescribed burning effects changes in canopy cover and soil/ Direct soil disturbance within the proposed activity area result construction is possible. Where burning is more intense (e.g., ground fuels), plants may be either directly consumed by fire changes to canopy cover or soils (e.g., removal of litter/ duff l were performed in the future, the actions would likely result in cumulative effects on rare plants.
Tree planting	X		X	**Very low**	Tree planting causes soil disturbance and may affect individu occurrences (documented occurrences would be protected by However, the scale of any such impact would be very small a **low cumulative effect** to rare plants (i.e., no measurable effe
Road construction and road decommissioning	X	X	X	**Low to moderate**	Past road construction in the project area has likely affected r habitat due to the soil disturbance and removal of canopy cov activity. Additionally, the machinery used in road construction subsequently, have resulted in the introduction of non-native, (weeds), which have further altered the habitat in these areas activities are considered to have a **low to moderate cumulat**
Road maintenance and storage	X	X	X	**Low**	The potential effects of road maintenance and storage are sir construction and decommissioning, except that the scale of d smaller and no new area is being disturbed. Consequently, t **cumulative effect** to rare plants.
Fire suppression	X		UNK**	**Low**	Some activities associated with fire suppression could impact direct injury/ mortality or soil disturbance (e.g., fireline constru Such impacts would have a **low cumulative effect** to rare pl
Pre-commercial timber stand improvement	X		X	**Very low**	Pre-commercial timber stand improvement entails pruning an prior to canopy closure. As a result of these activities, the tim reach canopy closure (which provides critical shade for some species) increases. Because the magnitude of change to car

					and the effects do not last long (less than 10 years), the **cum plants are considered very low**.
Trail construction and maintenance	X		X	**Low and very low**	Trail construction results in soil disturbance, but because the limited, effects would be restricted to individual rare plants or Consequently, the **cumulative effects to rare plants would** maintenance involves even more restricted scale of disturban **cumulative impacts would be very low**.
Weed treatment	X	X	X	**Low**	Ongoing weed treatments (specifically, herbicide treatment) Ongoing chemical weed treatments on the IPNF focus on roa can damage or kill plants other than the target weeds and ca periods of time, although the spatial scale of potential impacts most part, rare plants are not associated with disturbed habita include a few disturbance-tolerant species like Howell's gumw moonwort species. In the case of the moonworts, certain spe along older road prisms (*Botrychium lanceolatum* ssp. *viride* consequence, these species would be at greater risk of effec However, because few rare plant species occur in treatment spatial scale of impacts is restricted, the overall **cumulative e would be low**.
Wildfires	X		UNK	**Low to high**	Wildfires can result in changes to canopy cover and soil distu suppression increases the likelihood of more intense wildfires more intense soil disturbance and changes to canopy cover. **cumulative effects to rare plants from wildfires can range**
Public activities like cutting firewood, driving roads, camping, snowmobiling, hunting, hiking, picking berries	X	X	X	**Very low to low**	Small-scale soil disturbance and removal of forest canopy ma activities like cutting and skidding firewood and vehicle use. of flowers may also occur while hiking or camping. Overall, th activities is very small, such that potential effects would have cumulative effects on rare plants.
Recreational garnet mining	X	X	X	**Low**	Visitors to the Emerald Creek Garnet Area generally stay on lots, and within disturbed "mining" areas. Trampling or picking during the visit. Because the area has seen high levels of his disturbance, and because there are administrative boundarie **cumulative effects to rare plants from use of the garnet a**